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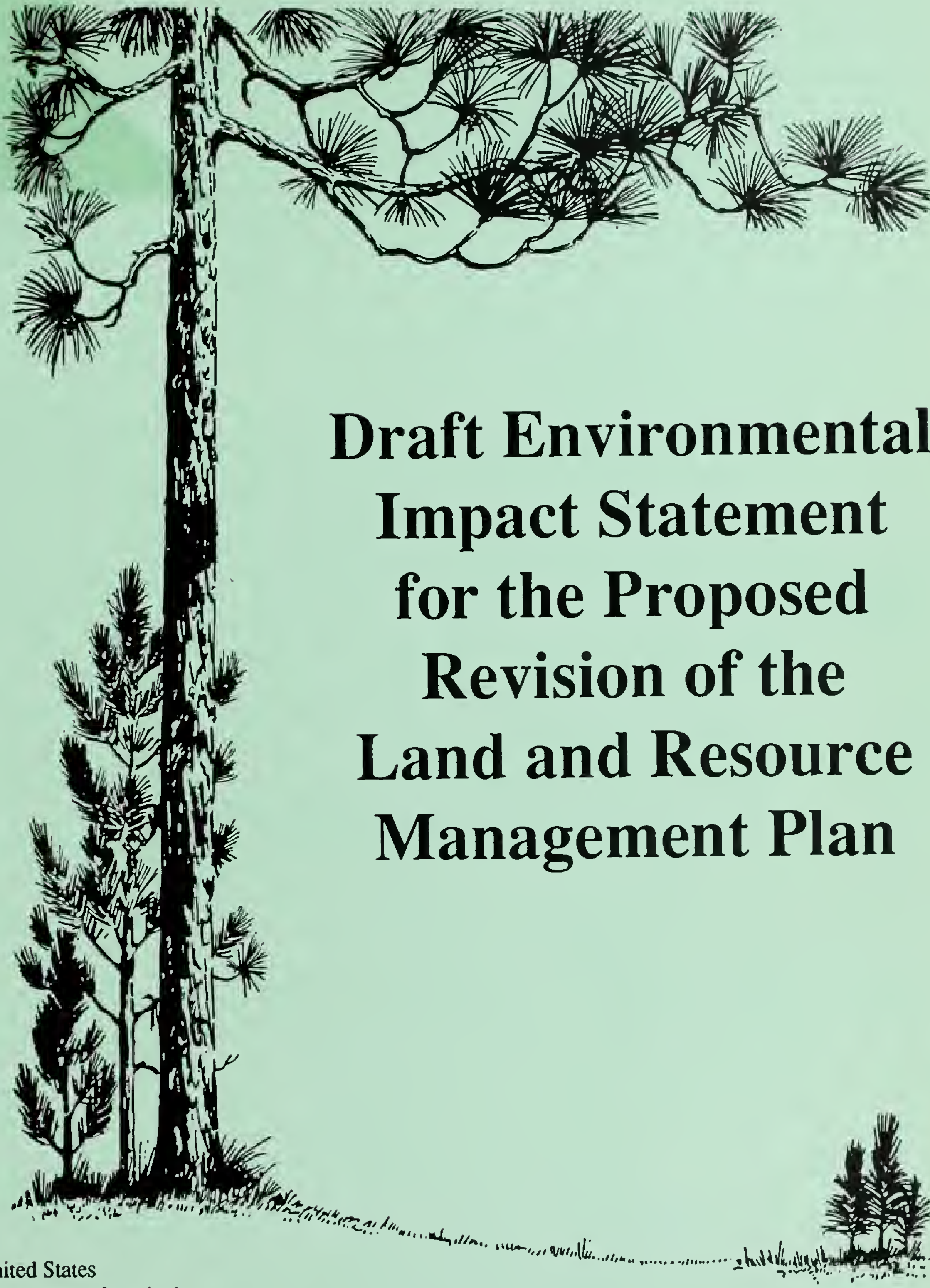
Forest



Draft Environmental Impact Statement for the Proposed Revision of the Land and Resource Management Plan

United States
Department of Agriculture
Forest Service
Southern Region

Draft
Environmental Impact Statement for the Proposed Revised Land and Resource Management Plan

August 1994
Charleston and Berkeley Counties, South Carolina

Lead Agency

United States Department of Agriculture
Forest Service
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Abstract

Five alternatives for revision of the *Land and Resource Management Plan* are described and compared. **A**–emphasizes maintaining natural ecosystems with a lower priority given to resource product outputs; **B**–emphasizes a moderate increase in recreational services and production of revenues for the local economy; **C**–continues the management of the *1985 Land and Resource Management Plan* as amended; **D**–emphasizes providing a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive motorized recreational opportunities; **F**–emphasizes providing a high level of recreational services, expanding the longleaf pine ecosystem, promoting mast-producing hardwoods and mixed stands and establishing areas for semi-primitive motorized recreational opportunities. **Alternative F is the alternative preferred by the Forest Service.**

Comments must be received by November 15, 1994.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decisionmaking process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

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Summary

Summary

This summary of the Draft Environmental Impact Statement (DEIS) summarizes the analysis of alternatives for managing the land and resources of the Francis Marion National Forest.

The companion document to the DEIS is the proposed revised version of the Forest Plan. It presents a detailed disclosure of the alternative that the Forest Service is recommending for implementation (alternative F).

Final versions of these documents will be published after public review and comment. With the final documents, a Record of Decision (ROD) will be issued.

The responsibility for choosing the alternative that becomes the Forest Plan lies with the Regional Forester in Atlanta, Georgia.

Purpose and Need of the Forest Plan

Forest Land and Resource Management Plans are required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). The purpose and need for the Forest Plan is to provide a Forest-wide, programmatic, integrated framework for analyzing and approving future site-specific projects and programs. Forest Plans are not a collection of projects and make no site-specific project decisions.

The scope of decisions addressed in a Forest Plan includes:

1. Establish multiple-use goals, objectives, and desired future condition for the Forest, including estimates of goods and services expected. [36 CFR 219.11(b)]

2. Multiple-use prescriptions and associated guidance for each management area on the Forest, including proposed and probable management practices. [36 CFR 219.11(c)]

3. Identify land that is suited/not suited for timber production. [36 CFR 219.14]

4. Determine allowable sale quantity (ASQ) for timber and the associated sale schedule. [36 CFR 219.16]

5. Recommend wilderness areas. [36 CFR 219.17]

6. Determine monitoring and evaluation requirements. [36 CFR 219.11(d)]

The NFMA regulations require that Forest Plans be revised on a 10 to 15 year cycle or sooner if conditions or the area covered by the Forest Plan change significantly. [36 CFR 219.10 (g)]

On September 21, 1989, the Francis Marion National Forest, located 30 miles north of Charleston sustained major damage by Hurricane Hugo. The devastation caused by Hugo drastically changed conditions on the Forest.

Issue Identification Process

Public involvement is a key part of the land management planning process. The purpose of a public comment period is to determine what goods, services and environmental conditions people want from the Forest.

Citizen participation helped identify public issues. About 100 people attended public meetings held in 5 locations. The Forest Planning Interdisciplinary Team (ID) team received 622 letters containing over 2,500 individual comments during the scoping period.

Identifying issues for consideration began in November of 1990. A list of issues was published in an October 1991 planning newsletter.

Public issues change over time and new or evolving issues may surface. Since the October 1991 newsletter was published, several changes have been made in the issues that are addressed in the DEIS and Forest Plan. The final list of issues addressed follows.

Issues Addressed

1. Recreational Facilities
2. Trail System
3. Scenery along Travelways
4. Off-highway Vehicle Travel
5. Roads
6. Habitat for Game and Non-game Wildlife
7. Protection of Threatened, Endangered and Sensitive Plants and Animals
8. Timber Management Strategy
9. Corridors Connecting Wilderness Areas
10. Herbicides
11. Prescribed Burning
12. Distribution and Mix of Tree Species
13. Wetlands
14. Revenue and Jobs

Alternative Development Process

Alternatives are developed to show ways of meeting the purpose and need for the Forest Plan while addressing a range of significant public issues. The analysis of the alternatives provides a basis for identifying the preferred alternative that more nearly maximizes public benefits, consistent with the resource integration and management requirements of 36 CFR 219.13 through 219.27.

The Forest Service Southern Region has prepared a *Draft Environmental Impact Statement for the Management of the Red-cockaded Woodpecker and its Habitat on National Forests in the Southern Region* (R-8 Red-Cockaded Woodpecker EIS), which establishes new regional long-term direction for the management of the bird and its habitat. Alternatives for the Forest Plan EIS must be compatible with the preferred strategy in the R-8 Red-cockaded Woodpecker EIS.

Alternatives Considered

Six alternatives were considered, labeled A, B, C, D, E and F. Five alternatives were analyzed in detail. Alternative E was not analyzed in detail since it was not compatible with the R-8 Red-Cockaded Woodpecker EIS preferred strategy.

The alternatives are described in terms of desired future condition and a comparison of activities and outputs.

The desired future condition is a long-term vision of the Forest for the alternative. The activities and outputs of the alternatives are compared in relation to the issues. Alternative F is the preferred alternative for the revision.

In all alternatives, timber sales in the hardwood and pond pine forest types were not included in the ASQ. This does not preclude harvesting hardwood and pond pine when needed to meet other Forest Plan objectives or for salvage.

Alternative C (Current)

This is the no action alternative which represents a continuation of the 1985 *Land and Resource Management Plan* as amended.

Desired Future Condition

The Forest is characterized by a variety of age classes and sizes of trees. Most stands are even-aged. Loblolly pine dominates the landscape. Timber is harvested throughout the Forest in the pine types. Roads are found throughout most of the Forest, and most are open to traffic. Prescribed burning is evident in the winter months. Hunting and viewing wildlife are common. Developed and dispersed recreational opportunities exist in some areas of the Forest. Off-highway vehicles are found on designated trails and throughout portions of the Forest outside of the hunting season. Creating an even flow of returns to local communities is a high priority.

Alternative A

This alternative emphasizes maintaining natural ecosystems with lower priority given to resource product outputs.

Desired Future Condition

The Forest landscape is dominated by large, old, widely-spaced pine trees with open park-like understories. Much of the Forest exhibits old-growth characteristics such as fallen logs, large trees and canopy gaps. Prescribed fire is used commonly here throughout the year. Savannahs and pockets of young longleaf pine trees are distributed throughout. Hardwoods are less common in the uplands and found mostly in swamps, along streams and other areas with natural barriers to fire. Some timber is harvested, but timber production is not a primary objective. Low-impact recreational opportunities such as hiking and sight-seeing are emphasized. Roads are found throughout the Forest; however, many are closed. Off-highway vehicles are encountered only on designated trails. Creating an even flow of dollar returns to local communities is not a priority.

Alternative B

This alternative emphasizes a moderate increase in developed and dispersed recreational services and production of revenues for the local economy.

Desired Future Condition

The Forest is characterized by a variety of age classes and sizes of trees. Most stands are even-aged, but some uneven-aged stands are found scattered throughout the landscape. Loblolly pine dominates the landscape. Timber is harvested throughout in the pine types. Roads are found throughout most of the Forest, and most are open to traffic. Prescribed burning is evident mostly in the winter months. Hunting is common. Developed and dispersed recreational services are found in many areas. Most recreational activities require a user fee. Off-highway vehicles are found only on designated trails. Creating revenues for the local communities is a high priority.

Alternative D

This alternative emphasizes providing a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive motorized recreational opportunities.

Desired Future Condition

Most of the Forest is characterized by a landscape featuring even-aged and uneven-aged pine stands of various ages and sizes. Loblolly is the dominant pine species. However, the acreage of longleaf pine has increased and is abundant on well-drained upland sites. Mast–producing hardwoods are common in areas protected from fire. Mixed pine and hardwood stands are often found in transition areas between predominantly pine types and predominantly hardwood types. Evidence of timber harvest is seen in pine types. Roads are found throughout; however, many are closed to public use. Non-game wildlife species are common. An abundance of recreational facilities and types of trails assures opportunities for a wide array of experiences. Most recreational services require user fees where permitted. Off-highway vehicular travel is permitted on trails throughout the year, and off-trail restricted use is allowed seasonally. There is little evidence of human disturbance in a portion of the Forest connecting some wilderness areas. Creating an even flow of returns to local communities is a priority.

Alternative F (Preferred)

This alternative emphasizes expanding the longleaf pine ecosystem, promoting mast-producing hardwoods and mixed pine/hardwood stands, providing a high level of recreational services and establishing areas for semi-primitive motorized recreational opportunities.

Desired Future Condition

The upland landscape contains predominantly even-aged pine stands of different sizes, ages and densities of trees. Some uneven-aged stands are found on drier sites. Loblolly is the dominant species. However, the acreage of longleaf has increased and is common on the well-drained upland sites. Mast-producing hardwoods are common in areas protected from fire. Mixed pine and hardwood stands are fairly common, often found in transition areas between predominantly pine types and predominantly hardwood types. Evidence of timber harvest is seen throughout the Forest in the pine types. Roads are found throughout most of the Forest, but many are closed to motorized vehicles. Prescribed burning is seen in the dormant season as well as during the growing season. Both game and non-game wildlife species are common. Off-highway vehicle travel is not permitted except on designated trails. Most of the Forest exhibits different degrees of human disturbance; however, a portion of the Forest has minimal human disturbance.

Comparison of Alternatives

The following matrix compares each alternative in relation to the issue. All of the activities and outputs are estimates, and implementation depends upon site-specific analysis.

S-1. Alternatives compared by issue.

Issue	Alternative				
	A	B	C (Current)	D	F (Preferred)
Recreation Facilities	Maintain existing facilities. No new construction. Emphasize low impact dispersed recreation.	Maintain existing facilities. Construct additional boat ramps, horse camps and campgrounds. Increase total capacity by 37%.	Maintain existing facilities. No new construction.	Maintain existing facilities. Construct additional boat ramps, canoe ramps, horse camps and campgrounds. Increase total capacity by 53%	Maintain existing facilities. Construct additional boat ramps, canoe ramps, horse camps and campgounds. Increase total capacity by 61%.
Trail System	Maintain existing trails. No additional trails will be constructed.	Maintain existing trails. Construct additional horse, canoe, OHV and bicycle trails. Increase total miles by 55%.	Maintain existing trails. No new trails will be constructed.	Maintain existing trails. Construct additional horse, canoe, OHV, Jeep, hiking and bicycle trails. Increase total miles by 98%..	Maintain existing trails. Construct additional horse, canoe, OHV hiking and bicycle trails. Increase total miles by 76%.
Scenery along roads	Scenery appears natural to slightly altered from 58% of roads and trails.	Scenery appears natural to slightly altered from 19% of roads and trails.	Scenery appears natural to slightly altered from 19% of roads and trails.	Scenery appears natural to slightly altered from 25% of roads and trails.	Scenery appears natural to slightly altered from 36% of roads and trails.
Off-highway Vehicle Access	OHV travel is not permitted off designated trails.	OHV travel is not permitted off designated trails.	Cross-country OHV travel is permitted with some restrictions. OHV travel limited to designated trails during hunting season.	Cross-country OHV travel is permitted with some restrictions.	OHV travel is not permitted off designated trails.
Roads	Approximately 40% of Forest roads are closed.	Approximately 15% of Forest roads are closed.	Approxximately 27% of Forest roads are closed.	Approxximately 31% of Forest roads are closed.	Approximately 29% of Forest roads are closed.
Habitat for Game and Non-game Wildlife	76% of the Forest is in late successional habitat in the long term. Eliminate wildlife openings. Emphasize game and non-game.	58% of the Forest is in late successional habitat in the long term. Increase number of wildlife openings. Emphasize game.	61% of the Forest is in late successional habitat in the long term. Maintain current wildlife openings. Emphasize game and non-game.	61% of the Forest is in late successional habitat in the long term. Reduce number of wildlife openings. Emphasize non-game.	58% of the Forest in late successional habitat in the long term. Increase amount of wildlife openings. Emphasize game and non-game.
Protection of Threatened, Endangered and Sensitive Plants and Animals	Entire Forest is in habitat management area for the red-cockaded woodpecker.	Approximately 64% of Forest is in habitat management area for the red-cockaded woodpecker.	Approximately 60% of Forest is in habitat management area for the red-cockaded woodpecker.	Entire Forest is in habitat management area for the red-cockaded woodpecker.	Approximately 64% of Forest is in habitat management area for the red-cockaded woodpecker.
	With the exception of variation in the red-cockaded woodpecker habitat management area, the management of PETS is the same in all alternatives. All alternatives are consistent with the Endangered Species Act.				

S-1. Con't Alternatives compared by issue.

Issue	Alternative				
	A	B	C (Current)	D	F (Preferred)
Timber Management Strategy	No suitable land. Timber production incidental.	Approximately 206,000 acres of suitable land. Average annual long-term timber production is about 8.8 million cubic feet. Emphasize even-aged management.	Approximately 203,000 acres of suitable land. Average annual long-term timber production is about 5.8 million cubic feet. Emphasize even-aged management.	Approximately 193,000 acres of suitable land. Average annual long-term timber production is about 6.9 million cubic feet. Mix of even and uneven-aged management.	Approximately 201,000 acres of suitable land. Average annual long-term timber production is approximately 6.3 million cubic feet. Mix of even and uneven-aged management.
Corridors Connecting Wilderness	No special management areas link wilderness.	No special management areas link wilderness.	No special management areas link wilderness.	Special management area links three of four wildernesses.	Special management area links all four wildernesses.
Herbicides	No herbicides allowed.	Herbicides allowed.	Herbicides allowed.	Herbicides allowed except in management area linking wildernesses.	Herbicides allowed except in managemetn area linking wildernesses.
Prescribed Burning	Approximately 40,000 acres are burned annually in the short term and 60,000 acres in the long term. About 60% of burns are during growing season in the long term.	Approximately 30,000 acres are burned annually in the short term and 40,000 acres in the long term. About 20% of burns are during growing season in the long term.	Approximately 30,000 acres are burned annually in the short term and 42,000 acres in the long term. About 60% of burns are during growing season in the long term.	Approximately 30,000 acres are burned annually in the short term and 35,000 acres in the long term. About 30% of burns are during growing season in the long term.	Approximately 30,000 acres are burned annually in the short term and 30,000 acres in the long term. About 30% of burns are during growing season in the long term.
Distribution and Mix of Tree Species	Long-term major forest types distributions are Loblolly Pine 35% Longleaf Pine 26% Mixed Types 4% Bottomland Hardwoods 8% Swamp Hardwoods 18% all other 9%	Long-term major forest types distributions are Loblolly Pine 46% Longleaf Pine 15% Mixed Types 4% Bottomland Hardwoods 8% Swamp Hardwoods 18% all other 9%	Long-term major forest types distributions are Loblolly Pine 42% Longleaf Pine 19% Mixed Types 0% Bottomland Hardwoods 12% Swamp Hardwoods 18% all other 9%	Long-term major forest types distributions are Loblolly Pine 40% Longleaf Pine 21% Mixed types 4% Bottomland Hardwoods 8% Swamp Hardwoods 18% all other 9%	Long-term major forest types distributions are Loblolly Pine 38% Longleaf Pine 21% Mixed types 6% Bottomland Hardwoods 8% Swamp Hardwoods 18% all other 9%
Wetlands	No pine acres on land suitable for timber production with hydric soils.	51,875 pine acres on land with hydric soils suitable for timber production.	51,875 pine acres on land with hydric soils suitable for timber production.	47,784 pine acres on land with hydric soils suitable for timber production.	45,266 pine acres on land with hydric soils suitable for timber production.
Revenue and Jobs	Long-term estimated average annual income is $10.8 million. Long-term estimated average employment is 461 jobs.	Long-term estimated average annual income is $17.7 million. Long-term estimated average employment is 753 jobs.	Long-term estimated average annual income is $12.3 million. Long-term estimated average employment is 519 jobs.	Long-term estimated average annual income is $15.0 million. Long-term estimated average employment is 639 jobs.	Long-term estimated average annual income is $13.9 million. Long-term estimated average employment is 591 jobs.

Summary of Environmental Effects

This section summarizes the detailed analysis of effects found in Chapter III. The analysis assumes that the probable activities will be conducted in compliance with all laws, regulations and policies governing activities on National Forest Land. Many effects are mitigated by direction contained in these laws, regulations and policies. Forest Plans generally provide direction for future activities or uses. The actual commitment to develop, use or affect resources is made in project level decisions.

Air

None of the probable activities in any alternative is considered a new major source of air pollution. The greatest potential for affecting air quality is from prescribed burning. All alternatives have similar levels of prescribed burning in the short term. Alternative A has the greatest amount of prescribed burning in the long term and the greatest potential to temporarily affect air quality. Alternatives F and D have the least potential to temporarily affect air quality.

Soil and Water

In all alternatives, the predicted sediment increase from erosion is below soil tolerance loss levels. All alternatives adopt South Carolina Best Management Practices and Federal requirements for managing wetlands and floodplains. The highest potential to affect soil and water is timber harvesting on hydric soils. Alternative C proposes the greatest amount of harvest on hydric soils, followed by alternatives B, F, D and A.

Fire

The risk of resource damaging wildfires was estimated based on the long-term prescribed burning levels, amount of longleaf pine and amount of regeneration harvest. Since red-cockaded woodpecker management is the main driver of these three components, there is relatively little difference between the alternatives. Alternative A has the lowest risk in the long term and alternative F has the highest.

Vegetation

The effects on vegetation was estimated using the probable long-term forest cover type composition and age class distributions of the types. The type and distribution of plant communities will be affected by the prescribed burning regime and the timber harvest methods and amounts.

Longleaf pine forest type and related plant communities will increase by 73 percent in alternative A, by 26 percent in alternative C, by 42 percent in alternative D and by 45 percent in alternative F. No increase is planned in alternative B. Mixed pine/hardwood stands will increase in alternative F. Hardwoods within pine stands will decrease and fire-related plant communities will increase due to wide-spread, growing-season prescribed burning in alternatives A, D and F. The long-term percentage of trees over 90 years old in pine types is 64 percent for alternative A, 38 percent for alternative B, 48 percent for alternative C, 42 percent for alternative D and 39 percent for alternative F.

Old Growth

The long-term potential old growth was estimated by major forest cover types. Potential old growth is defined as areas unsuitable for timber production and suitable timber production land that will contain trees over 100 years old in the future. Alternative A has the greatest potential for retaining old growth (100 percent of forested lands) followed by alternatives D (61 percent of forested lands), C (60 percent of forested lands), B (58 percent of forested lands) and F (55 percent of forested lands).

Proposed, Endangered, Threatened and Sensitive Plants and Animals

With the exception of variations in the red-cockaded woodpecker habitat management area, the management of PETS is the same in all alternatives. All alternatives are consistent with the Endangered Species Act. In alternatives A and D, the entire Forest is in the red-cockaded woodpecker habitat management area. In alternatives B and F, about 64 percent of the Forest is in the red-cockaded habitat management area. In alternative C, about 60 percent of the Forest is in the red-cockaded woodpecker habitat management area. The area in Alternative C is subject to change with a final decision on the R8 RCW strategy.

Wildlife

In all alternatives, habitat with trees aged 0-10 years old and snags will be abundant in the short term as a result of Hurricane Hugo. Approximately 10,000 acres of habitat with trees aged 0-3 years old will be maintained by pine harvest or burning pine regeneration in alternatives C, D and F in the first 10 years. Species such as white-tailed deer, bobwhite quail, yellow-breasted chat, Bachman's sparrow, white-eyed vireo and eastern bluebird and wild turkey should benefit. As the early successional stands created by Hugo begin to age, habitat conditions will favor species that utilize shrub/seedling habitats such as yellow-breasted chat and white-eyed vireo. Habitat will become less suitable for bluebird, white-tailed deer, wild turkey and bobwhite quail. Loss of mast-producing hardwoods from Hugo will result in lower numbers of wild turkey and grey squirrel.

In the long term, alternative A will have the most late successional habitat of the alternatives (76 percent of forested acres). Early successional habitat will be provided mostly by prescribed fire and natural disturbances. Due to the high level of prescribed burning and Forest-wide HMA, hardwood mast production, birds associated with the midstory of pine stands and carrying capacity for fox squirrel, gray squirrel and wild turkey will be reduced. Alternative A has the most acres in longleaf pine (63,600 acres) and the highest level of growing season burning (35,000 acres annually). This will create conditions favorable for bobwhite quail, bluebirds and Bachman's sparrow.

Alternatives B, C, D, and F have similar amounts of late successional habitat in the long term (58 percent to 61 percent). Alternative B has the most early successional habitat in the long term as a result of higher regeneration levels and increased wildlife openings. Habitat fragmentation will be highest in alternative B since this alternative has the most opened roads, wildlife openings and pine regeneration areas. Alternatives D and F will have less habitat fragmentation than alternatives B and C since more roads are closed, fewer acres are harvested and habitat linkages between wilderness areas are created.

Longleaf pine acres are expanded in alternatives D and F to 52,400 and 53,500 acres respectively. Annual growing season burning will be approximately 10,000 acres in these alternatives. This will create conditions favorable for bobwhite quail, bluebirds and Bachman's sparrow.

Alternative F has the highest level of mast-producing hardwoods and mixed pine/hardwood stands in the long term. This condition will benefit fox squirrel, wild turkey, red-eyed vireo and great-crested flycatcher.

Insects and Diseases

Due to extensive damage from Hugo, decay is expected to increase in the short term in all alternatives, especially in the hardwood types. Also, the Forest will have extensive areas of naturally regenerated, mid-successional pine especially favorable for pine bark beetles, pales weevils, pine sawflies, pine tip moths, fusiform rust, annosus root rot and brown spot needle blight. Generally, in the long term, all alternatives will have conditions favorable for insects and diseases associated with an older forest such as pine bark beetles, defoliators, root rot and other fungi. Alternative A has the most of this condition with 64 percent of the pine types over 90 years old in the long term. Alternatives B, C, D, and F range from 38 percent to 48 percent of the pine types over 90 years old in the long term.

Social and Economical Environment

In the long term, alternative A has the lowest level of jobs and income. More miles of roads will be closed and roadless areas will be recommended for wilderness which may reduce some traditional uses. User expectations will change from developed to primitive or semi-primitive. Total recreation visits are expected to remain similar to current levels. Long-term sustained yield capacity for timber production is estimated to be 44.2 MMCF per period.

Alternative B has the highest level of jobs and income. The least amount of roads will be closed and roadless areas will be recommended for wilderness. Traditional uses will continue. Recreation visits will be higher than alternatives A and C, but lower than alternatives D and F. Long-term sustained yield capacity for timber production is estimated to be 86.7 MMCF per period.

Alternative C has the second lowest level of jobs and income. Road closure will remain at current levels and roadless areas are not recommended for wilderness. Traditional uses will continue. Recreation visits will remain similar to current levels. Long-term sustained yield capacity for timber production is estimated to be 58.4 MMCF per period.

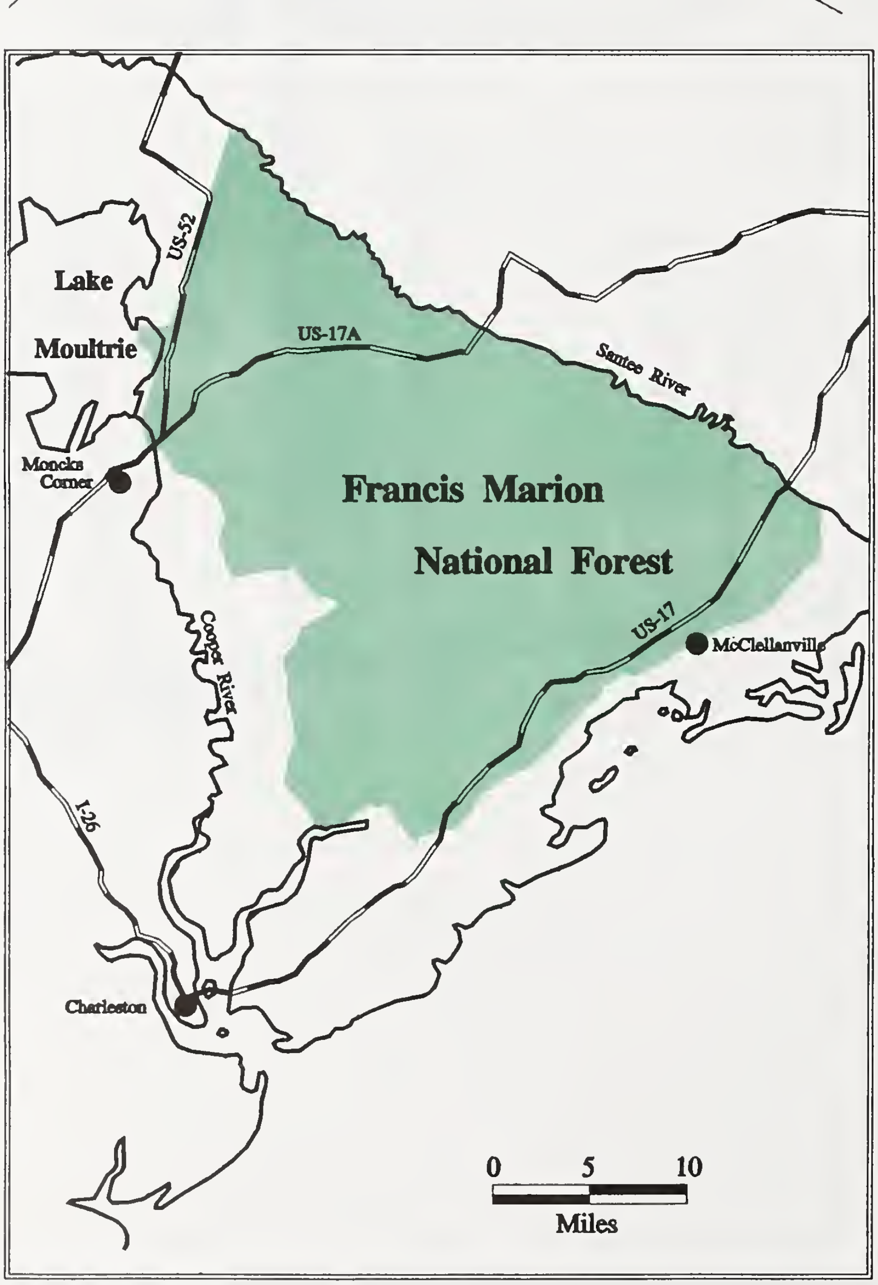
Alternative D has the second highest level of jobs and income. Road closure is at slightly higher levels than current. Roadless areas are not recommended for wilderness, but areas for semi-primitive motorized recreation connect some existing wilderness. Some traditional uses may be limited in these areas, but other uses will be added. This alternative will have the second highest recreational visits. Long-term sustained yield capacity for timber production is estimated to be 69.1 MMCF per period.

Alternative F has the third highest level of jobs and income. Road closure is at slightly higher levels than current. Roadless areas are not recommended for wilderness, but areas for semi-primitive motorized recreation connect all existing wilderness. Some traditional uses may be limited in these areas, but other uses will be added. This alternative will have the highest amount of recreation visits. Long-term sustained yield capacity for timber production is estimated to be 63.4 MMCF per period.

Chapter I

Purpose and Need

Location Map
Francis Marion National Forest



Purpose and Need

This Draft Environmental Impact Statement (DEIS) prepared by the USDA Forest Service describes the analysis of six alternatives for managing the land and resources of the Francis Marion National Forest. It describes the affected environment and discloses significant environmental effects of the alternatives considered.

The companion document to this DEIS is the draft version of the Revised Forest Plan. It presents a detailed disclosure of the alternative that the Forest Service is recommending for implementation.

Final versions of these documents will be published after public review and comment. With the final documents, a Record of Decision (ROD) will be issued.

The responsibility for choosing the alternative that becomes the Revised Forest Plan lies with the Regional Forester in Atlanta, Georgia.

Forest Location

The Francis Marion National Forest is located within Berkeley and Charleston counties in southeastern South Carolina and contains approximately 249,500 acres. The land the Forest occupies is in a triangle formed by the Santee River to the north, the Intra-coastal Waterway to the east and Lake Moultrie and the Cooper River to the west.

The Forest comprises about 12 percent of the public lands in the state of South Carolina. The Forest is within a 1/2 hour drive of the Charleston metropolitan area where nearly 1/2 million people reside. Major highways into the Forest include US highway 17, 17A, 52 and state highways 41 and 45.

How the DEIS is Organized

The DEIS is organized as follows:

Chapter 1, "Purpose and Need," identifies (1) the laws and regulations used to direct the planning and environmental analysis process and (2) the public issues concerning the land and resource management of the Francis Marion National Forest.

Chapter 2, "Alternatives, Including the Proposed Action," describes the alternatives, explains how they were formulated and how they will be compared.

Chapter 3, "The Affected Environment and Environmental Consequences," discusses the current environment and focuses on the resources and uses most likely to be affected by management decisions. Chapter 3 also discusses what is expected to happen in the environment under alternative ways of managing the Francis Marion National Forest. This chapter provides a basis for understanding the implications and differences among alternatives.

Chapter 4, "List of Preparers," contains the names of the management team members, interdisciplinary team members and other major contributors.

Chapter 5, is the "List of Agencies, Organizations, and Persons to whom copies of this DEIS are sent." Chapter 6 is the "Glossary;" chapter 7, the "Index;" and chapter 8, "References."

The Appendices contain technical discussions about the various aspects of the planning process. They contain detailed descriptions of some environments, analyses and effects.

Purpose and Need of the Forest Plan

Forest Land and Resource Management Plans are required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976. The purpose and need for the Forest Plan is to provide a Forest-wide, programmatic, integrated framework for analyzing and approving future site-specific projects and programs. Overall, the strategic Forest Plan decisions set the framework for attaining net public benefits Forest wide. Forest Plans are not a collection of projects and make no site-specific project decisions. The scope of decisions addressed in a Forest Plan includes:

1. Establish multiple-use goals, objectives, and desired future condition for the Forest, including estimates of goods and services expected. [36 CFR 219.11 (b)]

2. Multiple-use prescriptions and associated guidance for each management area on the Forest, including proposed and probable management practices. [36 CFR 219.11 (c)]

3. Identify land that is suited/not suited for timber production. [36 CFR 219.14]

4. Determine allowable sale quantity (ASQ) for timber and the associated sale schedule. [36 CFR 219.16]

5. Recommend wilderness areas. [36 CFR 219.17]

6. Determine monitoring and evaluation requirements. [36 CFR 219.11 (d)]

Other Environmental Impact Statements and decisions which provide management directions are:

- *Final Environmental Impact Statement for Suppression of Southern Pine Beetle* (USDA Forest Service–Southern Region, April 1987)

- *Final Environmental Impact Statement–Vegetation Management in the Coastal Plain/Piedmont* (USDA Forest Service–Southern Region, January 1989)

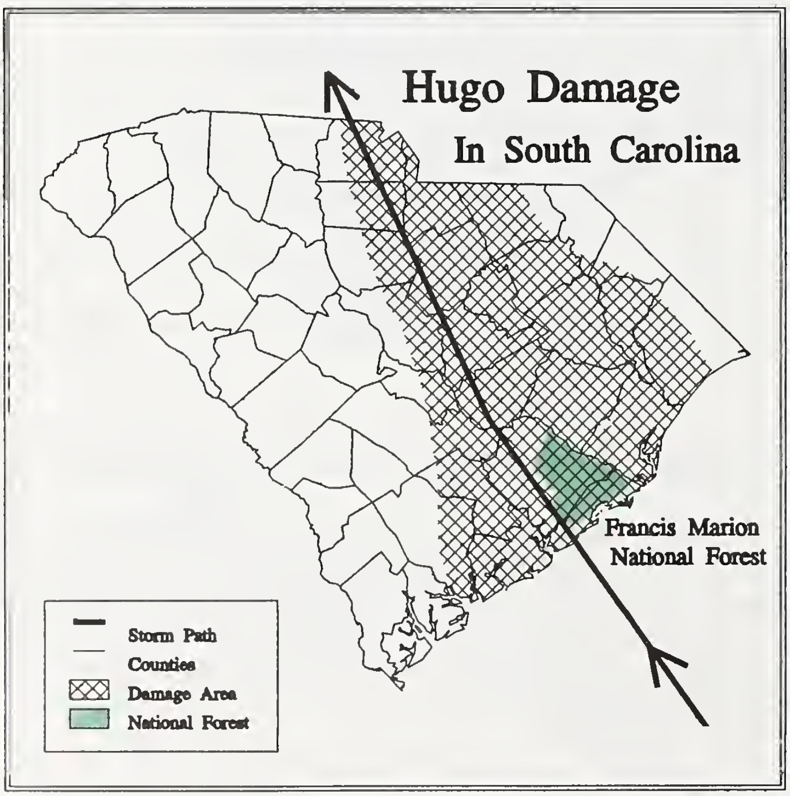
- *Draft Environmental Impact Statement for the Management of the Red-Cockaded Woodpecker and its Habitat on National Forests in the Southern Region* (USDA Forest Service–Southern Region, 1993)

The Forest Plan must be compatible with these previous decisions.

A final decision has not been made on management of the red-cockaded woodpecker. Until the final decision is made, red-cockaded woodpecker management is directed by the R-8 Interim Guidelines.

The NFMA regulations require that Forest Plans be revised on a 10 to 15 year cycle or sooner if conditions or the area covered by the Plan change significantly. [36 CFR 219.10 (g)]

On September 21, 1989, the Francis Marion National Forest, located 30 miles north of Charleston sustained major damage by Hurricane Hugo. The devastation caused by Hugo drastically changed conditions on the Forest.



The proposed action considered in this DEIS is to revise the current Forest Plan to accommodate significantly changed conditions, incorporate new information and address public concerns.

The Notice of Intent to prepare a draft and final EIS for the Revised Francis Marion Forest Plan and the scope of decisions to be considered in the revision were published in the Federal Register on June 19, 1990. The scope of change is limited to management area direction and standards and guideline pertaining to: (1) restoration of ecosystems including longleaf pine, (2) strategies for enhancement of red-cockaded woodpecker habitat, (3) game and non-game wildlife habitat management, (4) riparian area and wetlands management, (5) the desired future condition of each management area, (6) the recreation strategy for the Forest, and (7) the future capability of the timber resource.

Issue Identification Process

Public involvement is a key part of the land management planning process. The purpose of a public comment period is to determine what people want from the Forest in the form of goods, services and environmental conditions.

Citizen participation helped identify public issues. About 100 people attended public meetings held in 5 locations. The Forest Planning Interdisciplinary Team (ID) team received 622 letters containing over 2,500 individual comments during the scoping period.

Identifying issues for consideration began in November of 1990. The ID team compiled a potential set of 17 issues based on information gathered from the public and Forest Service employees. A planning newsletter published in February of 1991 notified the public of these issues. Based on a review of the public comments, the planning interdisciplinary team and Forest management team agreed that the issues had been adequately defined. A list of issues was published in an October 1991 planning newsletter.

Public issues change over time and new or evolving issues may surface. Since the October 1991 newsletter was published, several changes have been made in the issues that will be addressed in the DEIS and Draft Plan. A more detailed explanation of issue development is found in Appendix A.

Issues Addressed

1. Recreational Facilities

The issues are how many and what types of recreational facilities will be provided.

The Forest recognizes and accommodates the needs of our visitors by providing developed facilities for differing recreational uses. There is a concern about what the recreational program should emphasize.

2. Trail System

The issues are the number of miles provided for each use and the compatibility of uses on the same trail.

The Forest offers a variety of trail opportunities for both motorized and non-motorized modes of travel. There is a concern about what the trail program should emphasize.

3. Scenery along Travelways

The issue is how the scenery adjacent to roads and trails will be managed.

There is a concern about how management activities affect the scenery on the Forest. Some activities may improve scenery, while others may not. Most of the scenery is viewed from travelways such as roads and trails.

4. Off-highway Vehicle Travel

The issues are where, when and what type of off-highway vehicle use is permitted.

Off-highway vehicles are motorized vehicles capable of cross-country travel. There is a concern for what extent cross-country travel should be allowed.

5. Roads

The issue is what combination of open and closed roads is provided.

Roads within the Forest allow movement of people and resources in, out and within the Forest. A concern is how opened roads affect the quality of the environment.

6. Habitat for Game and Non-game Wildlife

The issue is the management emphasis given to game verses non-game animals.

The interaction between wildlife species is complex, and it is very difficult to separate habitat for game species from habitat for non-game species. There is a concern that too much emphasis has been given to game animals.

7. Protection of Threatened, Endangered and Sensitive Plants and Animals

The issue is the method and intensity of management for the protection of threatened, endangered and sensitive plant and animal species.

The issue focuses on the effects of red-cockaded woodpecker management on other components of the ecosystem and the social and economic effects.

8. Timber Management Strategy

The issues are:
(1) The amount of land on which timber production is allowed (suitability).
(2) The amount of wood products offered for sale (ASQ) for the first 10 years of the Plan.
(3) The system of management (even-aged or uneven-aged) and the associated regeneration methods.

Wood production is one of the many resources managed on national forests. There is a concern that this resource is emphasized too much or too little.

9. Corridors Connecting Wilderness Areas

The issue is how land adjacent to wilderness areas will be managed.

There is a concern that corridors of special management with limited human disturbance are needed in areas adjacent to existing wilderness areas.

10. Herbicides

The issue is the degree of herbicide use allowed to manage vegetation.

There is a concern that herbicides may pose long-term adverse environmental effects.

11. Prescribed Burning

The issues are the amount and timing of prescribed burning.

Prescribed burning is conducted to achieve many objectives. There are concerns that the level and timing of prescribed burns do not achieve certain objectives or it causes unacceptable environmental damage.

12. Distribution and Mix of Tree Species

The issues are:
(1) How the hardwood component within pine stands will be managed.
(2) How hardwood inclusions and transition zones will be managed.
(3) The relative amounts of tree species across the Forest.
(4) The management of mixed pine/hardwood stands on the Forest.

There are concerns that certain tree species are emphasized to the exclusion of other species.

13. Wetlands

The issue is the level of management activities occurring in wetlands.

There is the concern that management activities in wetlands will cause unacceptable damage.

14. Revenue and Jobs

The issue is the role the Forest should have in providing job opportunities for local residents and revenues to county governments.

Employment and revenues generated from the Forest are important to the social and economic well-being of residents and the budgets of county governments. There is a concern that increases or decreases in Forest programs could affect Forest dependent occupations and receipts to counties.

Planning Records are Available

The interdisciplinary team is the group responsible for developing the Revised Forest Plan. The team has made an effort to provide detailed explanations of each step of the revision process in the form of process records. This DEIS contains summaries of the process records and includes references to the parent records. These records can be viewed in the Forest Supervisor's Office in Columbia, South Carolina, or a copy of any record can be requested by writing to:

David W. Wilson
Forest Supervisor
4931 Broad River Road
Columbia, South Carolina 29210-4021

Chapter II

Alternatives Including the Proposed Action

Alternatives Including the Proposed Action

This chapter presents alternatives for managing the Francis Marion National Forest. It is divided into three main parts. The first discusses how the alternatives were developed. The second describes each alternative considered. The third compares how these alternatives respond to the issues.

Alternative Development Process

Alternatives are developed to show ways of meeting the purpose and need for the revision while addressing a range of significant public issues. The analysis of the alternatives provides a basis for identifying the preferred alternative that more nearly maximizes public benefits, consistent with the resource integration and management requirements of 36 CFR 219.13 through 219.27. Net public benefit is defined as the difference between the value of all outputs and positive effects (benefits) and the associated inputs and negative effects (costs) for producing those benefits.

Additionally, laws and regulations require certain alternatives based on national or regional concerns to satisfy National Forest Management Act regulations. As a minimum, an alternative must be developed that represents the current program, an alternative that emphasizes market opportunities, an alternative that emphasizes nonmarket opportunities and an alternative meeting RPA Program emphases.

In the Plan revision, the needs identified through monitoring and evaluation and through the Analysis of the Management Situation drive the process. Public issues, developed from the comments received on the proposal to change the Plan are also instrumental in alternative development. The alternatives represent ways of changing the Plan to address both these needs and the overall purpose of Forest Planning as directed in the National Forest Management Act of 1976. The alternatives were developed using the current *Francis Marion Land Management Plan* as a starting point. The current Plan is one of the six alternatives (alternative C).

Forest management can vary by what activities are done, where they are done and when they are done. Each alternative contains varying combinations of management activities (what), management areas (where), and activity schedules (when), to meet the alternative objectives. As a result, each alternative generates a different mixture of goods and services for the public and a different combination of resource outputs, land uses and environmental effects.

There are countless possible alternatives; however, we can study only a few of them. It is important that those we study be implementable and span a full range of possibilities.

A major concern is developing reasonable, implementable alternatives given the condition of the Forest after Hurricane Hugo damaged a large portion of the Forest. Approximately 86,000 acres now have trees under 10 years old. Loblolly pine has naturally seeded into areas previously occupied by longleaf pine and hardwood.

Habitat for the federally endangered red-cockaded woodpecker was heavily damaged. Eighty-nine percent of the cavity trees (nesting sites) and 63 percent of the birds were estimated to be destroyed in the storm. Before Hugo, the Forest contained one of the most concentrated population of these birds in the world.

Not only had the hurricane changed the situation for woodpeckers, but Regional management direction for the red-cockaded woodpecker has also changed. The Forest Service Southern Region has prepared a Draft *Environmental Impact Statement for the Management of the Red-cockaded Woodpecker and its Habitat on National Forests in the Southern Region* (R-8 Red-Cockaded Woodpecker EIS), which proposes new regional long-term direction for the management of the bird and its habitat. This plan revision process occurred simultaneously with the development of these Regional guidelines. Alternatives considered in detail must fit within the proposed Regional red-cockaded woodpecker guidelines.

Ecosystem Management

Another consideration in developing alternatives is the principle of ecosystem management. On June 4, 1992, the Chief of the Forest Service announced the agency's new policy, principles and guidelines for ecosystem management (letter, Appendix G). Under this policy, ecosystem management means using an ecological approach to achieve the multiple use management of National Forests by blending the needs of people and environmental values so that National Forests present diverse, healthy, productive and sustainable ecosystems. The policy reduces clearcutting as a standard commercial timber harvesting practice on National Forests. Clearcutting will be limited to areas where found to be the optimum regeneration method as required by 16 U.S.C. 1604(g)(3)(F)(i) and where it is essential to meet the Forest Plan objectives and requirements (letter, Appendix G).

Ecosystem management is the means we use to meet the goals specified in laws, regulations, the RPA program, Forest Plans and project decision documents. Overall, this mandate is to protect environmental quality while also producing resources people need. Ecosystem management is not choosing to have either resource products or natural conditions. Ecosystem management strives to attain both of these goals. Ecosystem management is an evolving concept for the Forest Service which will require adaptation and refinement in this approach to management.

Guidelines included in this policy for ecosystem management are:

Consider economical feasibility and the health, productivity and resilience of the land over time.

Think about the effects of proposed actions at several geographical scales and through time.

Protect special areas, endangered species, rare plant populations and cultural resources.

Work within the ecological potential of sites and landscapes.

Involve interested and affected people in the full process of making decisions about common resources.

Monitor research, interpret and adapt.

Integrate everything, but not necessarily everything on every acre at all times.

Ecological Classifications

One step in looking at the Forest at a different scale and working within the ecological potential of the landscape is through an ecological classification system. The Francis Marion National Forest has completed an ecological classification and mapping framework to identify land allocation options for the alternatives.

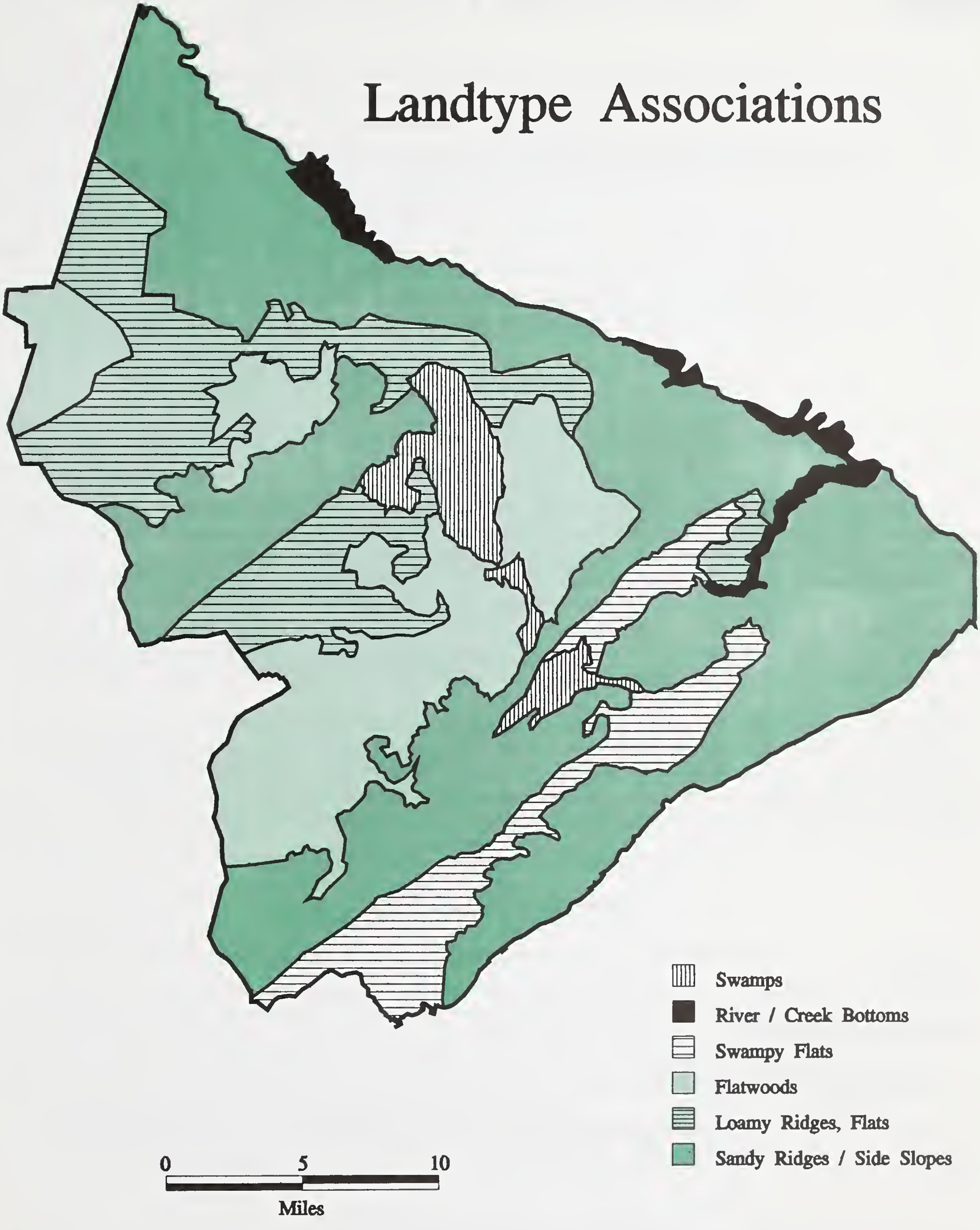
The classification process used existing inventories of soil, geological, vegetative and hydrological information. Distinct landscape units called Landtype Associations (LTAs) were tentatively identified by the interdisciplinary team. Further ground checking and refinement will be required to confirm the assumptions of this model.

Landtype associations were used to define management areas in some alternatives depending on the goals and objectives of the alternative. Landtype associations were also used to identify compatible practices and activities.

Table II-1 provides a brief description of the landtype associations. A more detailed explanation of ecological landtypes is found in Appendix B.

Table II-1. Landtype associations.

Landtype Association	Soil Drainage	Soil Texture	Landform	Dominant Tree Species	Acres
Swamps	Very Poorly Drained	Sand, Loam, Sandy Loam	Swamps, Bays	Swamp Hardwoods, Loblolly Pine	16,976
Swampy Flats	Poorly Drained	Loamy Sand, Loam	Swamps, Upland Flats	Loblolly Pine, Swamp Hardwoods	21,264
River/Creek Bottoms	Poorly Drained	Clay Loam, Sandy Loam	Floodplains	Bottomland and Swamp Hardwoods	7,273
Flatwoods	Poorly, Very Poorly Drained	Sandy Loam, Clay Loam, Loam	Uplands, Flats, Bays	Loblolly Pine, Longleaf Pine, Bottomland Hardwoods	38,766
Loamy Ridges, Flats	Poorly, Somewhat Poorly Drained	Loam, Sandy Loam, Clay Loam	Ridges, Upland Flats	Loblolly Pine, Longleaf Pine, Bottomland Hardwoods	38,766
Sandy Ridges, Side Slopes	Somewhat Poorly, Moderately, Well Drained	Loamy Sand, Sandy Loam, Sand	Ridges, Side Slopes	Loblolly Pine, Longleaf Pine, Upland Hardwoods	116,687


Landtype Associations
Swamps
River / Creek Bottoms
Swampy Flats
Flatwoods
Loamy Ridges, Flats
Sandy Ridges / Side Slopes
0
5
10
Miles

Alternatives Considered

Six alternatives were considered and labeled A, B, C, D, E and F. Alternative E, which used the 1985 guidelines for managing the red-cockaded woodpecker, was not considered in detail because it did not fall within the guidelines of the preferred alternative in the R-8 red-cockaded woodpecker DEIS. Alternatives B, D and F respond to the 1980 Resource Planning Act program strategy. Alternative F is the preferred alternative for this revision.

The alternatives are described in terms of management highlights, desired future condition, general management area configuration and direction, and a comparison of activities and outputs.

The management highlights contain some of the specific goals and objectives of the alternatives. The desired future condition is a long-term vision of the Forest for the alternative. Management areas are portions of the Forest with similar management objectives where compatible management prescriptions are applied. Each alternative examined has an associated map displaying the allocation of different portions of the Forest to different management areas. The activities and outputs of the alternatives are compared in relation to the issues. Alternative F is the preferred alternative for the revision.

Alternatives Considered in Detail

In all alternatives, timber sales in the hardwood and pond pine forest types were not included in the ASQ because of past problems in implementing scheduled sales, low product value and high logging cost. This does not preclude harvesting hardwood and pond pine when needed to meet Forest Plan objectives or for salvage.

All alternatives meet applicable laws, regulations and policies. All alternatives are within NFMA (36 CFR 219.27) requirements for resource protection, vegetative manipulation, silvicultural practices, even-aged management, riparian area protection, soil and water protection and diversity. In addition, the earliest age of timber harvest is equal to or greater than the culmination of mean annual increment, and periodic harvest volumes do not decrease from one period to the next (except between periods one and two) or exceed the long-term sustained yield (LTSYC) capacity. (36 CFR 219.16)

All alternatives depart from the non-declining yield constraint in the first period. Recent surveys identified about 44,000 acres of loblolly and longleaf pine which need thinning in the next 10 years. Due to the non-declining yield constraint, these areas normally would not be scheduled for thinning. In accordance with 36 CFR 219.16(a)(3), this departure from the non-declining yield principle will lead to better attainment of overall objectives of multiple-use management and significantly reduce high future mortality losses thereby facilitating future sustained yield.

Alternative C (Current)

This is the no action alternative which represents a continuation of the 1985 *Land and Resource Management Plan* as amended.

Management Highlights

Red-Cockaded Woodpecker Management

Current RCW management direction may change based on the R-8 DEIS for the RCW. Until the final decision is made on the management of the RCW, the Francis Marion's current RCW management is directed by the Interim Guidelines

◊ Manage red-cockaded woodpeckers using zones of 3/4 mile radius around cluster sites.
◊ Rotation age for loblolly and longleaf pine is 120 years within 3/4 mile of red-cockaded woodpecker clusters.

Wildlife Emphasis

◊ Enhance habitat for game and non-game species.
◊ Maintain existing wildlife openings.

Timber Management

◊ Manage timber in areas outside of the 3/4 mile radius of red-cockaded woodpecker clusters with rotations of 80 years for longleaf pine, 45-60 years for loblolly pine.
◊ Produce revenue through sawtimber management.

Vegetation Management

◊ Convert approximately 9,500 acres of loblolly to longleaf over the next 90 years.
◊ Maintain existing hardwood component up to 30 percent in pine stands.
◊ Emphasize even-aged management.
◊ Use all methods of vegetation management available including herbicides.

Fire

◊ Prescribe burn between 30 and 42 thousand acres per year, primarily in the winter.

Recreation

◊ No new recreational facilities or trails will be constructed unless demand indicates.

Roads

◊ Approximately 73 percent of Forest Service roads are open.

Corridors

◊ No special management areas connect wilderness areas.

Off-Highway Vehicles

◊ Off-highway vehicles are restricted to trails during hunting season. Portions of the Forest are open to OHV use outside of hunting season.

Desired Future Condition

The Forest is characterized by a variety of age classes and sizes of trees. Most stands are even-aged. Loblolly pine dominates the landscape. Timber is harvested throughout the Forest in the pine types. Roads are found throughout most of the Forest, and most are open to traffic. Prescribed burning is evident in the winter months. Hunting and viewing wildlife are common. Developed and dispersed recreational opportunities exist in some areas of the Forest. Off-highway vehicles are found on designated trails and throughout portions of the Forest outside of the hunting season. Creating an even flow of returns to local communities is a high priority.

The Forest is divided into the following management areas in this alternative.

Management Area 1 (719 acres) contains the Francis Marion Seed Orchard and progeny test areas. The Seed Orchard is managed to provide genetically improved seed to regenerate southern National Forests. Progeny test areas are devoted to testing and measuring the genetic gains of seed orchard breeding.

Management Area 2 (13,812 acres) contains the four congressionally designated wilderness areas on the Francis Marion National Forest: Wambaw Creek, Little Wambaw Swamp, Wambaw Swamp and Hell Hole Bay. These areas are to be managed in accordance with the provisions of (1) Wilderness Act of 1964 (PL 88-577), (2) PL 96-560 of 1980, (3) Secretary of Agriculture Regulations, (4) Executive Orders, (5) Department of Agriculture Policy Statements and (6) Forest Service Manual 2320.

Management Area 3 (169 acres) contains the developed recreational areas. Developed recreational sites are managed to provide the public with a variety of recreational opportunities.

Management Area 4 (6,076 acres) contains the Santee Experimental Forest and Guilliard Lake Research Natural Area (RNA). The Santee Experimental Forest is managed by the Southeastern Forest Experiment Station to accomplish forest research objectives. The Guilliard Lake RNA is protected as a research natural area with no active management.

Management Area 5 (6,068 acres) contains non-forest (crop areas, improved pasture, improved roads and power line clearings) and non-commercial forest (land incapable of growing commercial timber crops) within the "general forest zone" (excluding wilderness areas, developed recreational sites, Santee Experimental Forest, research natural areas, administrative sites, Greentree Reservoir and special areas).

Non-forest land is managed for specific benefits such as access, forage and utilities. The non-commercial forest land will be retained in its natural state.

Management Area 6 (609 acres) contains the water area on the Forest not specifically managed for fish or wildlife. This area has no active management. The management objective is to retain existing water quality.

Management Area 7 (20 acres) contains existing and planned work centers, lookout towers, Forest Service-owned houses and ranger offices. These sites are managed to serve resource programs and will be maintained to protect capital investment.

Management Area 8 (6,002 acres) contains areas managed to protect, preserve or interpret unique qualities such as scenic, biological, geological or historical.

Management Area 9 (5,601 acres) contains the active and inactive cluster sites of red-cockaded woodpeckers (RCW). These sites include the aggregate of cavity trees plus at least a 200-foot buffer zone around them. These sites are managed to protect this federally endangered species in accordance with the Endangered Species Act.

Management Area 10 (2,165 acres) contains stands of mixed pine/hardwood and loblolly pine in the "general forest area." This area is managed primarily for timber products. Other resources are managed in a manner compatible with intensive timber management. Intensive silvicultural practices are used to increase timber production.

Management Area 11 (101,986 acres) contains most of the "general forest area." The emphasis is on the coordinated management of resources as outlined in the goals and objectives of the alternative. No resource is singled out for emphasis in this management area.

Management Area 12 (353 acres) provides dispersed recreational opportunities and contains trails, trailheads and areas of concentrated public use. These areas are managed to provide high levels of dispersed recreational opportunities to the public.

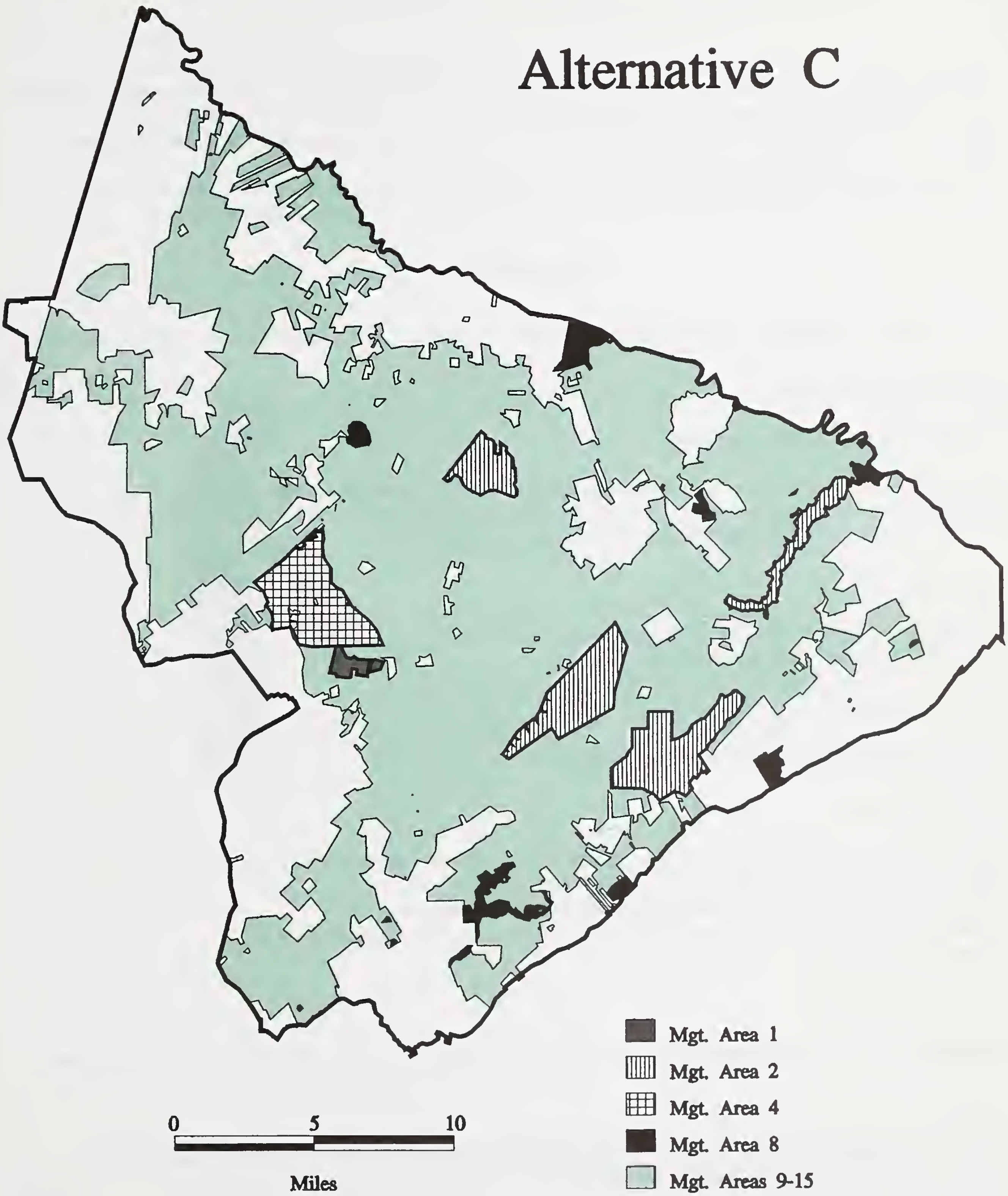
Management Area 13 (99,247 acres) contains areas of special benefit to wildlife such as managed ponds, wildlife openings, key areas, red-cockaded woodpecker foraging habitat, transition zones, old growth and other areas managed specifically for wildlife purposes. These areas are managed with an emphasis on wildlife with other resources managed in a manner compatible with wildlife management.

Management Area 14 (0 acres) is managed solely for the protection and maintenance of National Forest land.

Management Area 15 (6,676 acres) consists of replacement and recruitment stands for the red-cockaded woodpecker. Replacement stands are identified as adequate replacement nesting habitat for the existing clusters (active and inactive). Recruitment stands are identified as potential nesting habitat required to meet the identified population goal in each compartment.

Management Areas

Alternative C



A Different Approach to Management Areas

The following alternatives take a different approach to management areas from the current plan (alternative C). Management areas were zoned in alternatives A, B, D and F. For example, recreational areas, administrative sites, roads, trails, clearings, rights-of-way, water, red-cockaded woodpecker clusters and recruitment stands are not in separate management areas in these alternatives. These sites are found scattered across the Forest and have been incorporated into the zoned management areas of these alternatives.

The delineation of management areas in the following alternatives was further driven by the emphasis of the alternative, the landtype associations and zones needed to fulfill the goals and objectives of the alternative.

Alternative A

This alternative emphasizes maintaining natural ecosystems with lower priority given to resource product outputs.

Management Highlights

Red-Cockaded Woodpecker Management

◊ Manage red-cockaded woodpeckers with a Forest-wide habitat management area (HMA).
◊ Rotation ages are 150 years for loblolly pine and 200 years for longleaf pine. Some timber will be managed to restore and to maintain habitat for threatened and endangered species.

Wildlife Emphasis

◊ Emphasize late successional wildlife species, game and non-game.
◊ Gradually eliminate maintained wildlife openings.

Timber Management

◊ Management for timber production will not be done.

Vegetation Management

◊ Convert approximately 27,000 acres of loblolly pine to longleaf pine over the next 90 years.
◊ Prescribe burn for plant community restoration and maintenance.
◊ Use low impact ground disturbing management techniques when possible.
◊ Conditions will reflect both even-aged and uneven-aged structure: no silvicultural system.
◊ Restrict herbicide use.

Fire

◊ Prescribe burn between 40 and 65 thousand acres per year, approximately 22–54 percent during the growing season.

Recreation

◊ No new developed recreational facilities will be constructed. Emphasize dispersed recreational opportunities for educational and environmental awareness purposes.

Roads

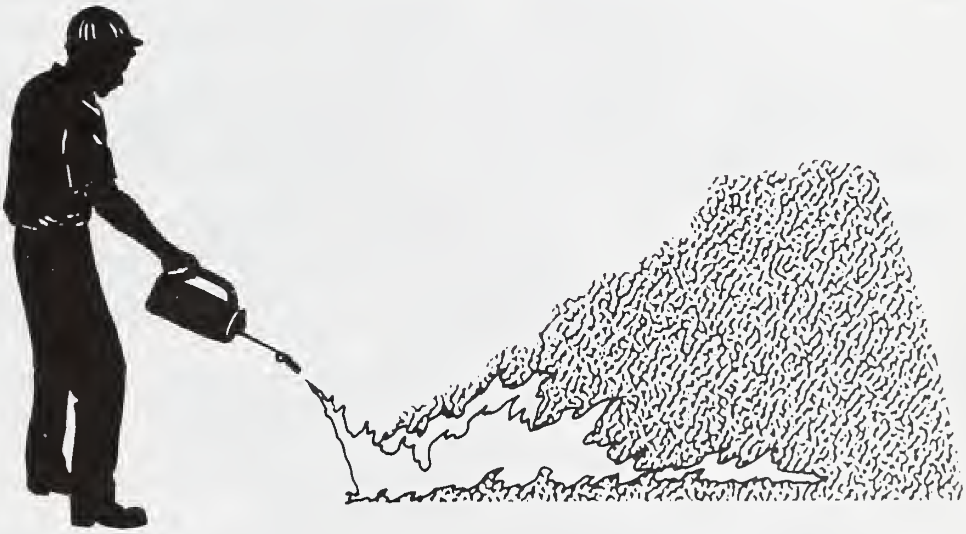
◊ Approximately 60 percent of Forest Service roads are open.

Corridors

◊ No special management areas connect wilderness areas.

Off-Highway Vehicles

◊ Off-highway vehicles are restricted to trails.



Desired Future Condition

The Forest landscape is dominated by large, old, widely-spaced pine trees with open park-like understories. Much of the Forest exhibits old-growth characteristics such as fallen logs, large trees and canopy gaps. Prescribed fire is used commonly here throughout the year. Savannahs and pockets of young longleaf pine trees are distributed throughout. Hardwoods are less common in the uplands and found mostly in swamps, along streams and other areas with natural barriers to fire. Some timber is harvested, but timber production is not a primary objective. Low impact recreational opportunities, such as hiking and sight-seeing, are emphasized. Roads are found throughout the Forest; however, many are closed. Off-highway vehicles are encountered only on designated trails. Creating an even flow of dollar returns to local communities is not a priority.

The Forest is divided into the following management areas in this alternative.

Management Area 1 (719 acres) is the same as alternative C.

Management Area 2 (13,812 acres) is the same as alternative C.

Management Area 4 (6,076 acres) is the same as alternative C.

Management Area 8 (7,422 acres) is the same as alternative C, except the roadless areas recommended for wilderness are included.

Management Area 16 (14,022 acres) includes the swamps and river/creek bottom landtype associations. This area is managed primarily to expand and/or to maintain the plant communities associated with swamps and river floodplains. Possible activities include planting and improvement cuts.

Management Area 17 (14,270 acres) includes the swampy flats and the river/creek bottom landtype associations. This area is managed to establish and/or to maintain plant communities associated with swamp hardwood, bottomland hardwoods, wet loblolly and mixed stands. Possible activities include planting and improvement cuts, and some prescribed fire.

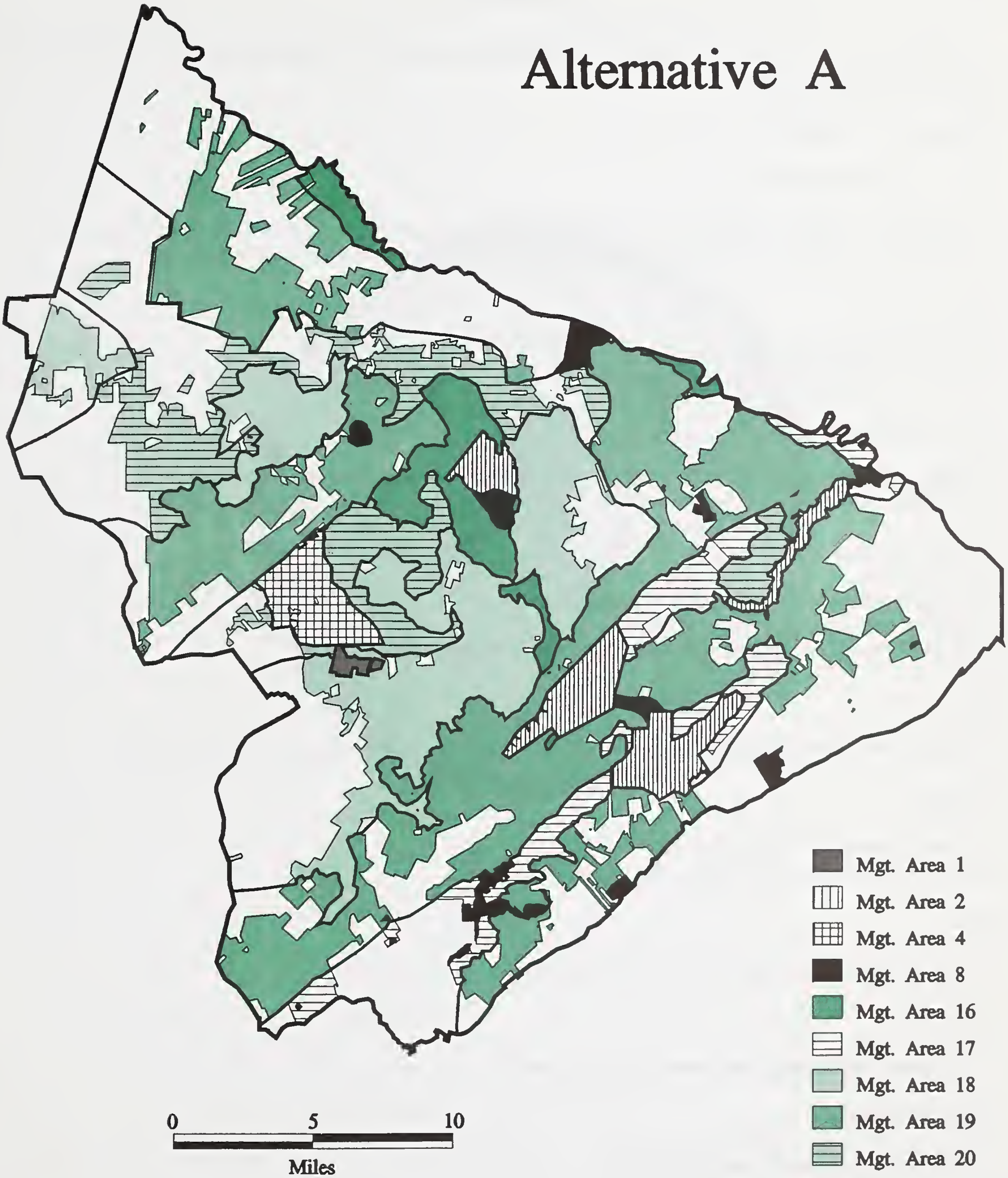
Management Area 18 (49,046 acres) includes the flatwoods landtype association. This area is managed to establish and/or to maintain plant communities associated with poorer drained loblolly, swamp hardwoods, bottomland hardwoods. Some timber management activities for red-cockaded woodpecker management include harvest and understory control. Prescribed burning includes both growing season and dormant season burns. Hardwoods grow primarily in areas with natural barriers to fire.

Management Area 19 (111,888 acres) includes the sandy ridges/side slopes landtype association. This area is managed to establish and/or to maintain plant communities associated with longleaf, drier loblolly sites, hardwoods and bays. Loblolly is converted to longleaf on the drier sites. Harvests are done as needed for red-cockaded woodpecker management. Growing season burns are emphasized. The hardwood component within pine stands is relatively low because of regular prescribed burning.

Management Area 20 (32,248 acres) includes the loamy ridges/flats landtype association. This area is managed to establish and/or to maintain plant communities associated with poorly drained loblolly, swamp and bottomland hardwoods. Some timber management activities for red-cockaded woodpecker management include harvest and understory control. Prescribed burning includes both growing season and dormant season burns. Hardwoods are found primarily in areas with natural barriers to fire.

Management Areas

Alternative A



Alternative B

This alternative emphasizes a moderate increase in developed and dispersed recreational services and production of revenues for the local economy.

Management Highlights

Red-Cockaded Woodpecker Management

◊ Manage red-cockaded woodpeckers with approximately 2/3s of the Forest in a habitat management area.
◊ Rotation ages in habitat management areas are 120 years for longleaf and 100 years for loblolly.

Wildlife Emphasis

◊ Enhance habitat for game species.
◊ Increase the number of wildlife openings.

Timber Management

◊ Rotation ages are 60 years for longleaf and 50 years for loblolly outside of habitat management areas.
◊ Produce revenue through timber management.

Vegetation Management

◊ Maintain approximately 37,000 acres of longleaf pine.
◊ Emphasize even-aged management.
◊ Use all methods of vegetative management, including herbicides.

Fire

◊ Prescribe burn between 30 and 40 thousand acres per year, about 20 percent during the growing season.

Recreation

◊ Construct additional facilities and trails.
◊ Charge user fees for developed and dispersed recreation.

Roads

◊ Approximately 85 percent of Forest Service roads are open.

Corridors

◊ No special management areas connect wilderness areas.

Off-Highway Vehicles

◊ Off-highway vehicles are restricted to trails.

Desired Future Condition

The Forest is characterized by a variety of age classes and sizes of trees. Most stands are even-aged, but some uneven-aged stands are found scattered throughout the landscape. Loblolly pine dominates the landscape. Timber is harvested throughout in the pine types. Roads are found throughout most of the Forest, and most are open to traffic. Prescribed burning is evident mostly in the winter months. Hunting is common. Developed and dispersed recreational services are found in many areas. Most recreational activities require a user fee. Off-highway vehicles are found only on designated trails. Creating revenues for the local communities is a high priority.

The Forest is divided into the following management areas in this alternative.

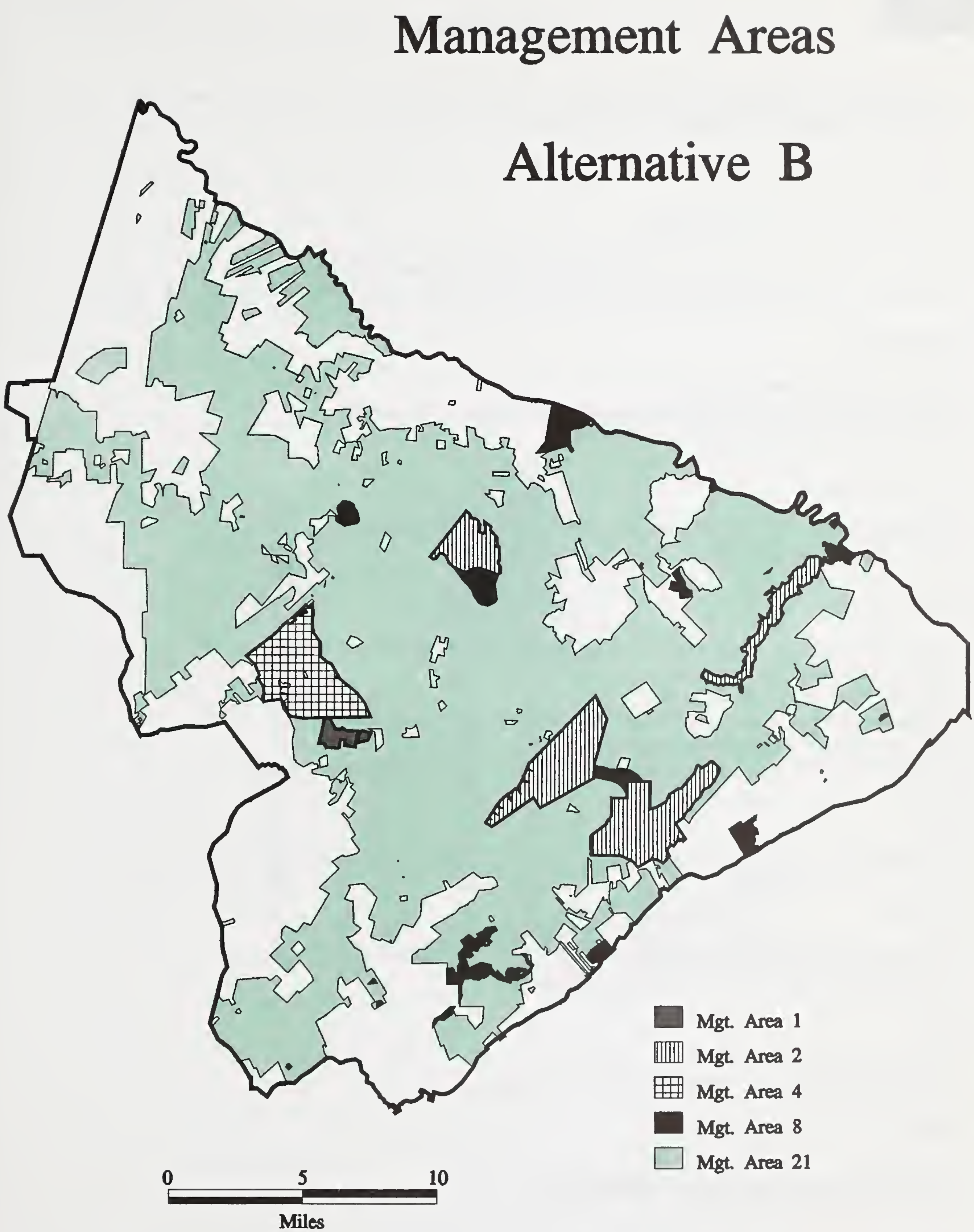
Management Area 1 (719 acres) is the same as alternative C.

Management Area 2 (13,812 acres) is the same as alternative C.

Management Area 4 (6,076 acres) is the same as alternative C.

Management Area 8 (7,422 acres) is the same as alternative C, except the roadless areas recommended for wilderness are included.

Management Area 21 (221,474 acres) includes all landtype associations. Coordinated management of resources achieves the Forest-wide goals and objectives. Management highlights as described on page II-12 will be accomplished in this management area.


Management Areas
Alternative B
Mgt. Area 1
Mgt. Area 2
Mgt. Area 4
Mgt. Area 8
Mgt. Area 21
0
5
10
Miles

Alternative D

This alternative emphasizes providing a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive motorized recreational opportunities.

Management Highlights

Red-Cockaded Woodpecker Management

◊ Manage red-cockaded woodpeckers with a Forest-wide habitat management area.
◊ Rotations in the habitat management area are 120 to 200 years for longleaf and 100 to 150 years for loblolly.

Wildlife Emphasis

◊ Enhance habitat for non-game species.
◊ Maintain existing wildlife openings with emphasis on planting native species
◊ Create and maintain travel corridors for wildlife.

Timber Management

◊ Rotations are 120 to 200 years for longleaf and 100 to 150 years for loblolly.
◊ Grow large trees for sawtimber.

Vegetation Management

◊ Convert approximately 15,500 acres of loblolly pine to longleaf over the next 90 years.
◊ Increase mast-producing hardwoods.
◊ Promote mixed pine/hardwood stands.
◊ Emphasize burning to maintain or expand fire dependent plant communities.
◊ Use even-aged and uneven-aged management.
◊ Herbicide use is allowed except in special management corridors (Management Area 23).

Fire

◊ Prescribe burn between 30 and 35 thousand acres per year, about 20–30 percent during the growing season.

Recreation

◊ Construct additional facilities and trails.
◊ Charge user fees for recreation where regulations apply.

Roads

◊ Approximately 69 percent of Forest Service roads are open.

Corridors

◊ Special management areas connect wilderness areas.

Off-Highway Vehicles

◊ Restricted use of off-highway vehicles is allowed throughout most of the Forest.

Desired Future Condition

Most of the Forest is characterized by a landscape featuring even-aged and uneven-aged pine stands of various ages and sizes. Loblolly is the dominant pine species. However, the acreage of longleaf pine has increased and is abundant on well drained upland sites. Mast-producing hardwoods are common in areas protected from fire. Mixed pine and hardwood stands are often found in transition areas between predominantly pine types and predominantly hardwood types. Evidence of timber harvest is seen in pine types. Roads are found throughout; however, many are closed to public use. Non-game wildlife species are common. An abundance of recreational facilities and types of trails assures opportunities for a wide array of experiences. Most recreational services require user fees where permitted. Off-highway vehicular travel is permitted on trails throughout the year, and off-trail restricted use is allowed seasonally. There is little evidence of human disturbance in a portion of the Forest connecting some wilderness areas. Creating an even flow of returns to local communities is a priority.

The Forest is divided into the following management areas in this alternative.

Management Area 1 (719 acres) is the same as alternative C.

Management Area 2 (13,812 acres) is the same as alternative C.

Management Area 4 (6,076 acres) is the same as alternative C.

Management Area 8 (6,002 acres) is the same as alternative C.

Management Area 22 (106,513 acres) includes the sandy ridges and side slopes landtype association. Restoring and expanding the fire dependent longleaf ecosystem and associated communities are emphasized in this area. Converting loblolly to longleaf is emphasized on the drier sites by using timber harvests, planting and/or prescribed fire. Prescribed burns are allowed in naturally regenerated loblolly stands that are to be converted to longleaf and are less than 10 years of age. Growing season burns are used, and natural fire barriers such as swamps, streams and depressions dictate the number of hardwoods within the area.

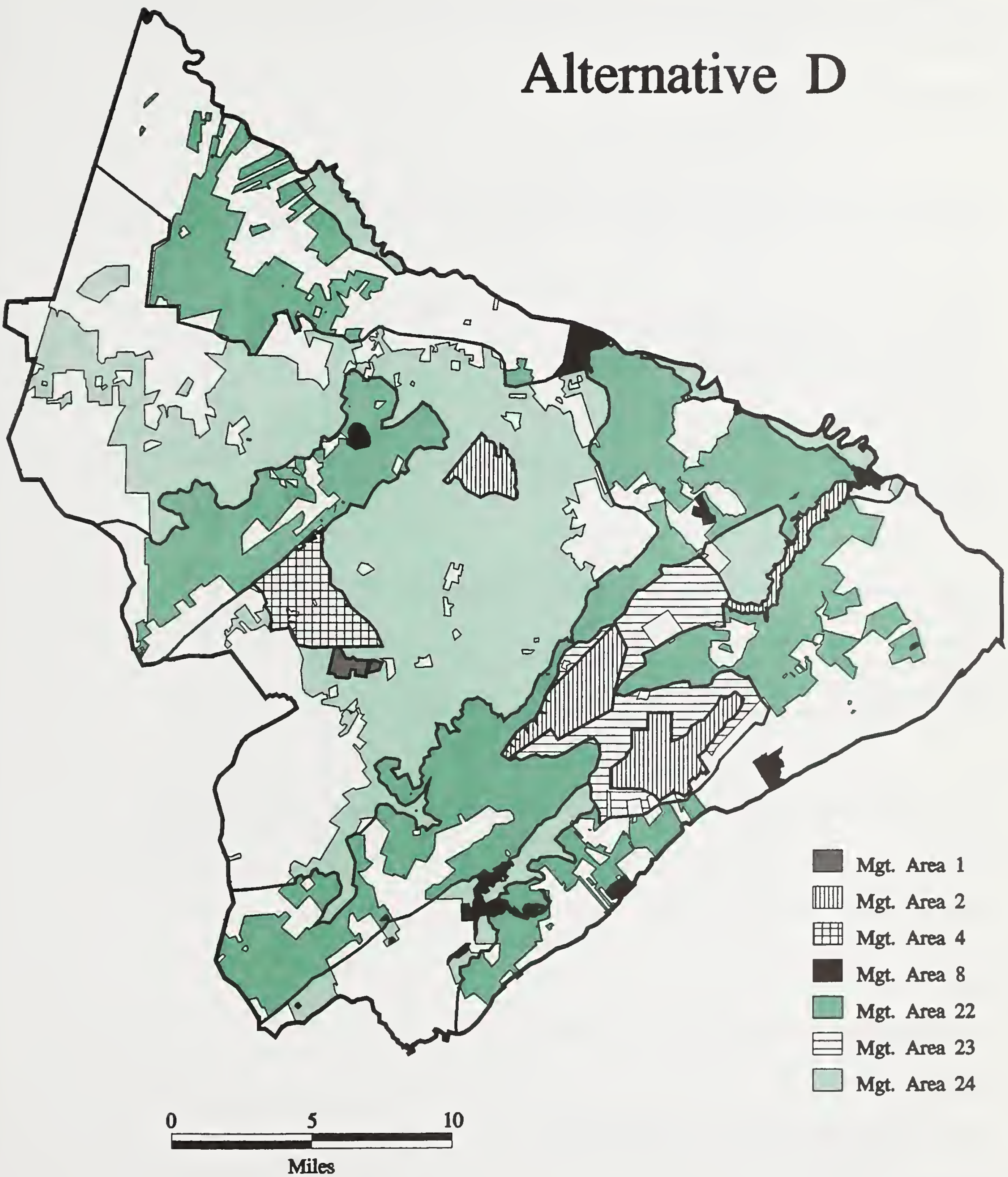
Management Area 23 (13,234 acres) is managed as a zone for semi-primitive motorized recreational opportunities and provides a natural land base link between three wilderness areas. These areas provide old growth characteristics. Management activities include prescribed burning and some timber harvest to maintain red-cockaded woodpecker habitat and to reduce fuels to lessen fire hazards near private property and public roads. Road closure is emphasized in this area.

Management Area 24 (103,147 acres) contains area where no resource is singled out for emphasis. Both even-aged and uneven-aged management activities are available in this area. Uneven-aged management is emphasized on drier loblolly pine sites when not in conflict with red-cockaded woodpecker management. Even-aged management is emphasized on wetter loblolly pine sites and longleaf areas to meet red-cockaded woodpecker and timber objectives.

Prescribed burning will be conducted in both growing and dormant seasons. Prescribed burns are allowed in naturally regenerated loblolly stands that are to be converted to longleaf and are less than 10 years old.

Management Areas

Alternative D



Alternative F

This alternative emphasizes expanding the longleaf pine ecosystem, providing a high level of recreational services, promoting mast-producing hardwoods and mixed pine/hardwood stands and establishing areas for semi-primitive motorized recreational opportunities.

Management Highlights

Red-Cockaded Woodpecker Management

◊ Manage red-cockaded woodpeckers with 2/3s of the Forest in a habitat management area.
◊ Rotation ages in habitat management areas are 120 to 200 years for longleaf and 100 to 150 years for loblolly.

Wildlife Emphasis

◊ Enhance habitat for game and non-game species.
◊ Increase number of wildlife openings.
◊ Create and maintain travel corridors for wildlife.

Timber Management

◊ Rotation ages are 70 to 120 years for longleaf and 60 years for loblolly outside the habitat management areas.
◊ Produce revenue by sawtimber management.

Vegetation Management

◊ Convert approximately 16,500 acres of loblolly pine to longleaf over the next 90 years.
◊ Increase mast-producing hardwoods.
◊ Promote mixed pine/hardwood stands.
◊ Burn to maintain or expand fire dependent plant communities.
◊ Use even-aged and uneven-aged management.
◊ Allow herbicides except in special management corridors (Management Area 29).

Fire

◊ Prescribe burn approximately 30 thousand acres per year, about 13 percent during the growing season.

Recreation

◊ Construct additional facilities and trails.

Roads

◊ Approximately 68 percent of Forest Service roads are open.

Corridors

◊ Special management areas connect wilderness areas.

Off-Highway Vehicles

◊ Off-highway vehicles are restricted to trails.

Desired Future Condition

The upland landscape contains predominantly even-aged pine stands of different sizes, ages and densities of trees. Some uneven-aged stands are found on drier sites. Loblolly is the dominant species. However, the acreage of longleaf has increased and is common on the well drained upland sites. Mast-producing hardwoods are common in areas protected from fire. Mixed pine and hardwood stands are fairly common, often found in transition areas between predominantly pine types and predominantly hardwood types. Evidence of timber harvest is seen throughout the Forest in the pine types. Roads are found throughout most of the Forest, but many are closed to motorized vehicles. Prescribed burning is seen in the dormant season as well as during the growing season. Both game and non-game wildlife species are common. Off-highway vehicle travel is not permitted except on designated trails. Most of the Forest exhibits different degrees of human disturbance; however, a portion of the Forest has minimal human disturbance.

The Forest is divided into the following management areas in this alternative.

Management Area 1 (719 acres) is the same as alternative C.

Management Area 2 (13,812 acres) is the same as alternative C.

Management Area 4 (6,076 acres) is the same as alternative C.

Management Area 8 (6,002 acres) is the same as alternative C.

Management Area 26 (111,232 acres) includes the sandy ridges/side slopes landtype association. Restoring and expanding the fire dependent longleaf ecosystem and associated communities are emphasized. Management is coordinated to achieve timber management, red-cockaded woodpecker and other wildlife objectives. Converting loblolly to longleaf is emphasized on drier sites by using timber harvests, planting and/or prescribed fire. Prescribed burns are allowed in naturally regenerated loblolly stands that are to be converted to longleaf and are less than 10 years old. Growing season burns are emphasized, and natural fire barriers such as swamps, streams and depressions dictate the amount of hardwoods within the area.

Management Area 27 (27,324 acres) includes portions of the river/creek bottoms, loamy ridges/flats and swampy flat landtype associations. Hardwoods and mixed stands are managed to maintain, expand, or enhance wildlife corridors, transition areas between uplands and lowlands, and hard mast-producing species. Hardwood quality and species composition will be managed through plantings, thinnings, and other timber stand improvement techniques. Loblolly pine stands outside the red-cockaded woodpecker habitat management area may be converted to mixed hardwood-pine stands. Loblolly stands will not be converted to mixed stands within 1/4 mile of clusters. Mixed pine-hardwood stands may be managed within the HMA, outside of the 1/4 mile zone.

Management Area 28 (63,523 acres) includes portions of the flatwoods and loamy ridges/flats landtype associations. Coordinated management of resources achieves the Forest's goals and objectives. No resource is singled out for emphasis in this management area. Both even-aged and uneven-aged management activities are available in this area. Uneven-aged management is used on drier loblolly pine sites when not in conflict with red-cockaded woodpecker management. Even-aged management is emphasized on wetter loblolly pine sites and longleaf areas to meet red-cockaded woodpecker and timber objectives. The amount of hardwood allowed within even-aged pine stands is determined by proximity to red-cockaded woodpecker clusters. Mast-producing hardwood inclusions and key transition zones will be protected from prescribed fire. Prescribed burning will be conducted in both growing and dormant seasons. Prescribed burns are allowed in naturally regenerated loblolly stands that are to be converted to longleaf and are less than 10 years of age.

Management Area 29 (20,815 acres) includes the swamps and a portion of the swampy flats landtype associations. This area is managed as a zone for semi-primitive motorized recreational opportunities and provides a natural land base link between wilderness areas. Management activities include prescribed burning and timber harvests to maintain red-cockaded woodpecker habitat and to reduce fuels to lessen fire hazards around private property and public roads. This area will provide old growth characteristics. Roadless areas are maintained as roadless in this management area.

Management Areas

Alternative F

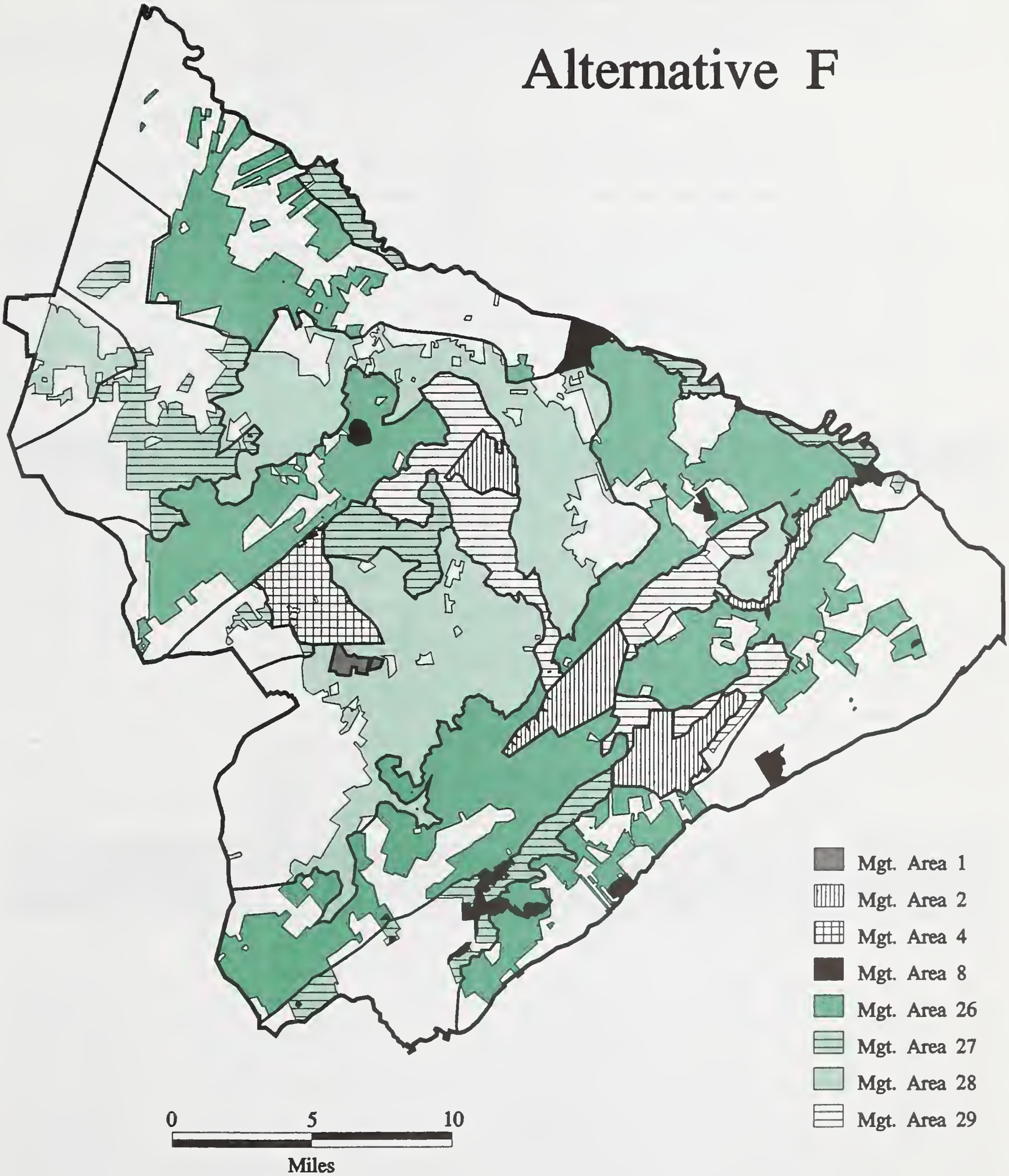


Table II-2. Management area allocation in acres by alternative.

Management Area	Alternatives				
	A	B	C	D	F
1	719	719	719	719	719
2	13,812	13,812	13,812	13,812	13,812
3			169		
4	6,076	6,076	6,076	6,076	6,076
5			6,068		
6			609		
7			20		
8	7,422	7,422	6,002	6,002	6,002
9			5,601		
10			2,165		
11			101,986		
12			353		
13			99,247		
14			0		
15			6,676		
16	14,022				
17	14,270				
18	49,046				
19	111,888				
20	32,248				
21		221,474			
22				106,513	
23				13,234	
24				103,147	
25					
26					111,232
27					27,324
28					63,523
29					20,815
Total	249,503	249,503	249,503	249,503	249,503

Comparison of Alternatives

This section compares how each alternative addresses the issues and management concerns. The discussion concentrates on those factors with measurable differences among the alternatives. These factors are presented in graph or table format to facilitate comparison. They are organized under the issue addressed.

1. Recreational Facilities

This section compares the number and type of recreational facilities provided by alternative.

New construction is proposed in alternatives B, D and F. Alternative F provides the most. These alternatives emphasize providing additional opportunities for camping facilities and access for water related activities. No recreational facilities would be constructed during the first period for alternatives A, and C. Alternatives B and D emphasize collection of user fees for developed recreational uses where permitted.

Recreational facilities range in number of facilities and PAOTs as well as development level. Development levels range from level 1 which is the most primitive to level 5, the most modern. (See Glossary for complete explanation of recreation site modification levels.)

Table II-3 displays the number, type and development level for recreational facilities planned for construction in the first period.

Table II-3. Recreational facilities planned (end of first period).

Alternative				
A	B	C	D	F
None	Construct approximately 2 boat ramps 1 horse camp (Dev. Level 3) 1 campground (Dev. Level 5)	None	Construct approximately 2 boat ramps 2 canoe access areas 2 horse camp (Dev. Level 3, 3) 2 campgrounds (Dev. Level 5, 4)	Construct approximately 2 boat ramps 5 canoe access areas 2 horse camp (Dev. Level 3, 4) 3 campgrounds (Dev. Level 5, 4, 4)

Table II-4 displays the total number of recreational facilities by activity that will be available at the end of the first period.

Table II-5 compares the capacity of the area or facility. This capacity is measured in people-at-one-time (PAOT) which is the maximum number of people that can comfortably occupy or use a facility or area at one time.

Table II-4. Total number of developed recreational facilities (end of first period).

Facility	Alternative				
	A	B	C	D	F
Boat Ramps	5	7	5	7	7
Campgrounds	2	3	2	4	5
Canoe Access	0	0	0	2	5
Horse Trail Camps	0	1	0	2	2
Hunt Camps	2	2	2	2	2
Picnic Areas	3	3	3	3	3
Rifle Ranges	2	2	2	2	2
Swimming Sites	1	1	1	1	1
Visitor Center	1	1	1	1	1

Table II-5. Recreational facility capacity in people-at-one-time (PAOT) (end of first period).

Facility	Alternative				
	A	B	C	D	F
Boat Ramps	350	500	350	500	500
Campgrounds	100	500	100	600	700
Canoe Access	0	0	0	100	130
Horse Trail Camp	0	50	0	100	100
Hunt Camp	145	145	145	145	145
Picnic Areas	180	180	180	180	180
Rifle Ranges	30	30	30	30	30
Swimming Sites	120	120	120	120	120
Visitor Center	689	689	689	689	689

2. Trail System

This section compares the estimated total miles by type of trail to be constructed in each alternative.

Table II-6 displays the miles of trail construction proposed for the first period. Alternative D would construct the most miles of new trails for both motorized and non-motorized travel. In alternatives A and C no new trails would be constructed. Alternatives B and D emphasize collecting user fees for dispersed recreational uses.

Table II-7 summarizes the total miles of trail by type that would be available at the end of the first period. The mileages in Alternative C, current direction, are the miles currently available on the Forest.

Table II- 6. Trail construction (miles) (end of first period).

Trail Type	Alternative				
	A	B	C	D	F
Motorized					
Canoe	0	0	0	0	0
Motorcycle/ATV	0	20	0	20	20
Jeep	0	0	0	20	0
Non-Motorized					
Bicycle	0	5	0	10	10
Canoe	0	10	0	10	10
Hiking	0	0	0	10	10
Horse	0	15	0	20	20

Table II-7. Total miles of trail (end of first period).

Trail Type	Alternative				
	A	B	C	D	F
Motorized					
Canoe	11	11	11	11	11
Motorcycle/ATV	40	60	40	60	60
Jeep	0	0	0	20	0
Non-motorized					
Bicycle	0	5	0	10	10
Canoe	1.5	11.5	1.5	11.5	11.5
Hiking	20	20	20	30	30
Horse	18	33	18	38	38

Figure II-1 compares the total miles of trail for each alternative.

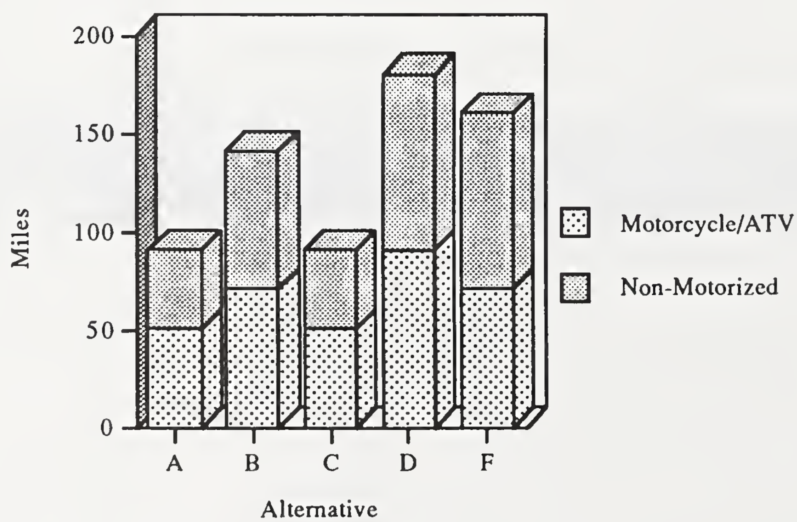


Figure II-1. Total miles of trail at end of first period.

Table II-8 displays the activities permitted by trail type. These restrictions would be the same in all alternatives.

Table II- 8. Compatibility of uses on trail. (◊ indicates permitted.)

	Activity						
Type of Trail	Horseback Riding	Hiking	Mountain Biking	Boats without Motors	Boats with Motors	Motorcycle & ATVs Less than 50" Wide	4 WD Vehicles over 50" wide
Horse	◊	◊	◊				
Hiking		◊	◊				
Mountain Bike		◊	◊				
Wambaw Creek Wilderness Can				◊	◊		
Hellhole Bay Wilderness Can				◊			
Non-wilderness Canoe				◊	◊		
Motorcycle/ATV		◊	◊			◊	
Jeep						◊	◊

3. Scenery along Travelways

The visual concern most often expressed by the public is how management activities along roads and trails will change the landscape appearance. This is generally considered to be a strip of land 200 feet from each side of the road or trail. Landscapes seen from roads are more sensitive than other areas because their appearance may significantly affect the viewers's recreational experience.

In the *1985 Land and Resource Management Plan,* visual quality objectives (VQOs) were established for the entire Forest based on criteria contained in the Forest Service's visual management handbook. VQOs provide the land manager with management objectives and guide the amount of visual impacts that management activities may have on the appearance of the landscape. There are five categories of acceptable landscape alteration illustrated in Figure II-2.

Preservation Human activities do not change the natural appearance.

Retention Human activities are not evident to the casual Forest visitor.

Partial Retention Human activity may be evident, but must remain subordinate to the characteristic landscape.

Modification Human activity may dominate the characteristic landscape, but must at the same time, follow naturally established form, line, color and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.

Maximum Modification Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Depending on the goals and objectives of each alternative, visual objectives vary.

Visual Quality Objective Categories

PRESERVATION

NATURAL

RETENTION

NATURAL APPEARING

PARTIAL RETENTION

SLIGHTLY ALTERED

MODIFICATION

MODERATELY ALTEREI

MAXIMUM MODIFICATION

HEAVILY ALTERED

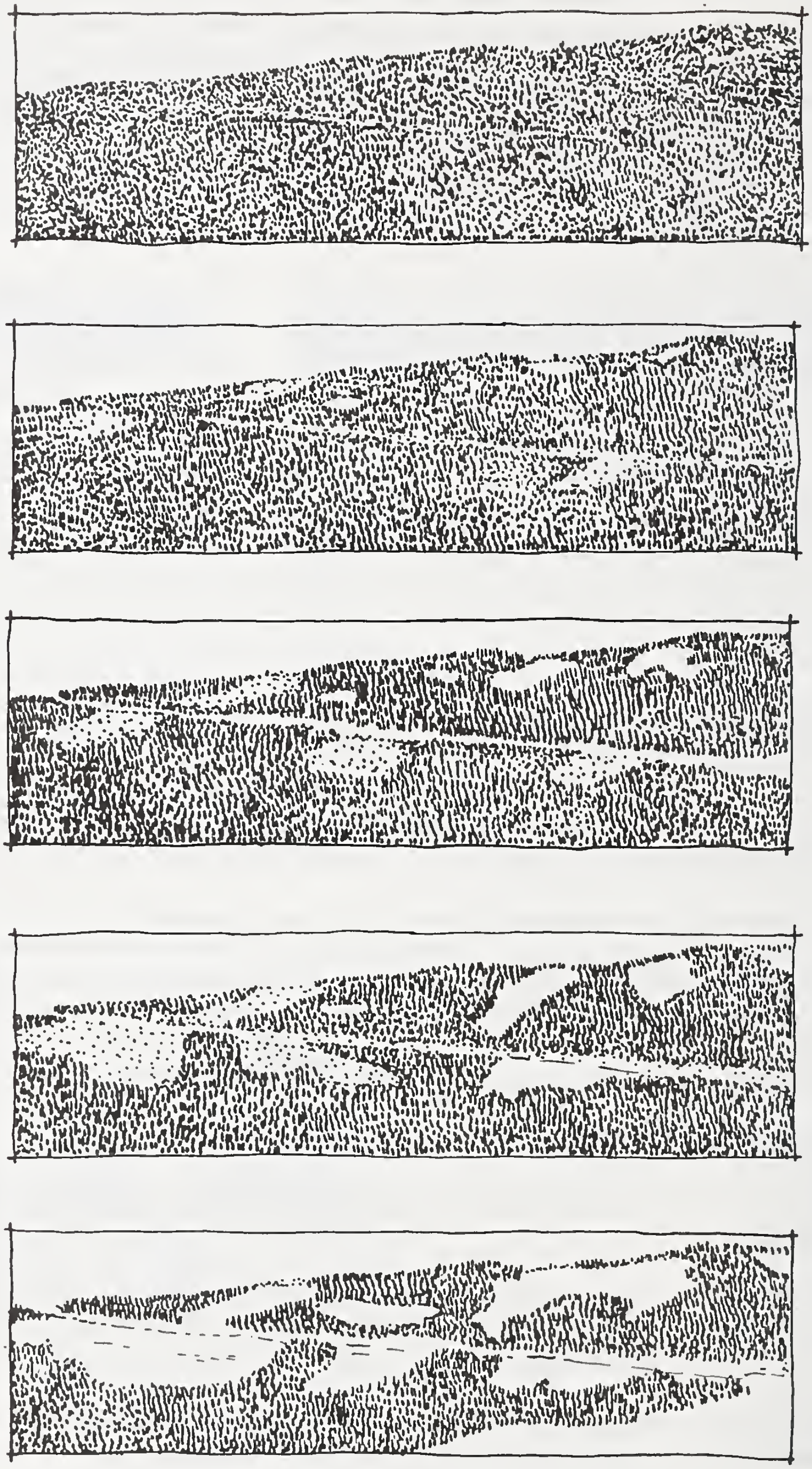


Figure II-2. Visual Quality Objective categories.

Table II-9 displays the miles of road by Visual Quality Objectives (VQOs) for all roads within Forest Service ownership.

Table II-9.	**Visual Quality Objective (VQO) summary of all roads on National Forest land.**				
	Alternative				
	A	B	C	D	F
VQO	Miles				
Preservation	9	9	9	9	9
Retention	28	7	7	47	43
Partial Retention	351	114	110	114	186
Modification	332	590	594	550	482
Maximum Modification	0	0	0	0	0

4. Off-Highway and Off-Trail Vehicle Access

Off-highway vehicles (OHVs) are motorized vehicles capable of cross-country travel. They include motorcycles, all terrain vehicles (ATVs), and other 4-wheel drive vehicles. OHV users travel on designated trails and also enjoy the off-trail experience of cross-country travel. A comparison among alternatives of trail use by OHVs is discussed under issue number 2, Trail System. The following discussion compares off-highway and off-trail OHV use among the alternatives.

All four wilderness areas and the Guilliard Research Natural Area (RNA) are closed to all motorized vehicular use. This is constant in all alternatives. All public off-highway and off-trail motorized travel is prohibited in administrative sites, developed recreational sites, the seed orchard and progeny test areas, and all other special areas such as Sewee Shell Mound, Guilliard Scenic Area, Santee Experimental Forest, Cedar Hill Island, The Battery, Watahan Plantation, Big Ocean Bay, I'on Swamp, Honey Hill proposed RNA, Blue Springs, Tibwin, cemeteries, cultural resource sites, and other botanical areas. These restrictions also remain constant in all alternatives.

In alternatives A, B, and F, OHV travel is not permitted off designated trails.

Alternative C allows restricted off-highway and off-trail travel throughout the Forest. Additional restrictions found in alternative C include prohibited use in the following areas: permanent wildlife openings; cleared rights-of-way for power lines, telephone lines, and pipe lines; water courses (except to cross); and regeneration areas where trees are 10-feet tall or less. OHV use is restricted to trails during hunting season.

Alternative D also allows restricted off-highway and off-trail travel throughout most of the Forest.

Alternative A, B and F are the most restrictive for OHV use. Alternative D is the least restrictive, most of the Forest is opened.

5. Roads

Figure II-3 illustrates the probable miles of road constructed by alternative.

The most significant comparison among alternatives is how the road system is managed.

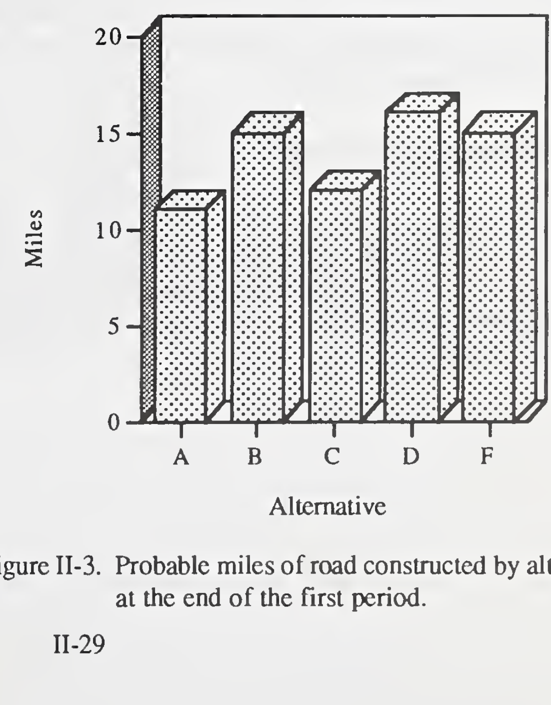


Figure II-3. Probable miles of road constructed by alternative at the end of the first period.

Figure II-4 illustrates the estimated miles of closed roads by alternative. Closed roads are those roads permanently or periodically closed to traffic. If any new roads are constructed, the ratio of open/closed road miles will remain the same as shown in Figure II-4.

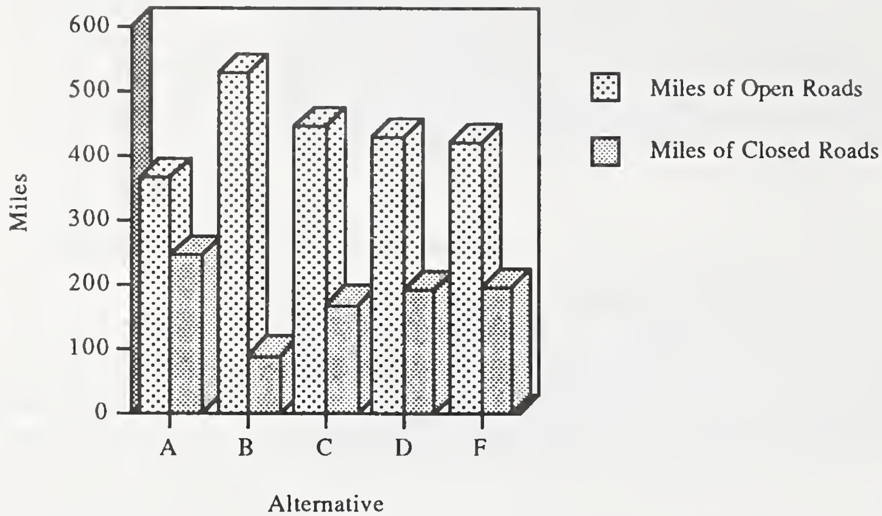


Figure II-4. Miles of open and closed roads at the end of the first period.

6. Habitat for Game and Non-Game Wildlife

Wildlife habitat is a dynamic and complex component of the forest ecosystem. It is virtually impossible to separate habitat for game from habitat for non-game species. However, to compare among alternatives, several elements of wildlife habitat are viewed separately. Elements used to compare alternatives concerning this issue include permanent openings, early successional habitat, late successional habitat, species composition (particularly hardwood component), and mast-producing hardwoods. Some other elements important in describing wildlife habitat include prescribed fire, age class distribution, and disturbance (open and closed roads). These are discussed in detail under other issues and are referenced in the comparisons of habitat for game and non-game wildlife.

Maintained Permanent Openings

The total acres of permanent non-forested openings include rights-of-way and maintained wildlife openings (WLOs). Rights-of-way include electric lines, gas lines and other utility corridors, railroads and maintained closed road rights-of-way. The size of the wildlife openings averages 2 acres. Miles of closed roads were also used in the calculation of maintained non-forested openings in the rights-of-way category. For more information on number of closed roads by alternative see Figure II-4.

Table II-10 displays the acres of maintained wildlife openings and rights-of-way. Alternative A will gradually eliminate all maintained wildlife openings, and the number of closed roads will increase. Closed roads will not be maintained as permanent openings. The number of closed roads will also increase in alternatives D and F; a portion of these roads will be maintained as permanent non-forested openings. Additional acres of wildlife openings will be created in alternatives B and F. Alternative B decreases the number of closed roads.

Table II-10. Acres of maintained wildlife openings and rights-of-way.

	Alternative				
	A	B	C	D	F
Acres of Wildlife Openings	0	810	710	710	810
(# of wildlife openings)	(0)	(453)	(403)	(403)	(453)
Rights-of-way	105	120	135	140	135
Total Acres Permanent Openings	105	930	845	850	945

Early Successional Habitat

Forest regeneration as well as wildlife openings and rights-of-way contribute to early successional habitat. Figure II-5 displays the average number of acres in early succession. (This figure includes stands less than 3 years old and areas maintained in this early seral condition through the use of prescribed fire.)

The acres displayed in alternative C include acres of delayed regeneration resulting from prescribed burns in periods 1 and 2. Alternative A includes acres prescribed burned to convert loblolly to longleaf in period 1. Alternatives D and F include acres prescribed burned to convert loblolly to longleaf and to delay the regeneration of loblolly in period 1.

Although alternatives A and D exhibit periods without any scheduled regeneration harvest, the Forest will still have early successional habitat. This will result from both wild and prescribed fire, natural disasters such as hurricanes, disease and insect outbreaks, and from harvests needed for red-cockaded woodpecker habitat.

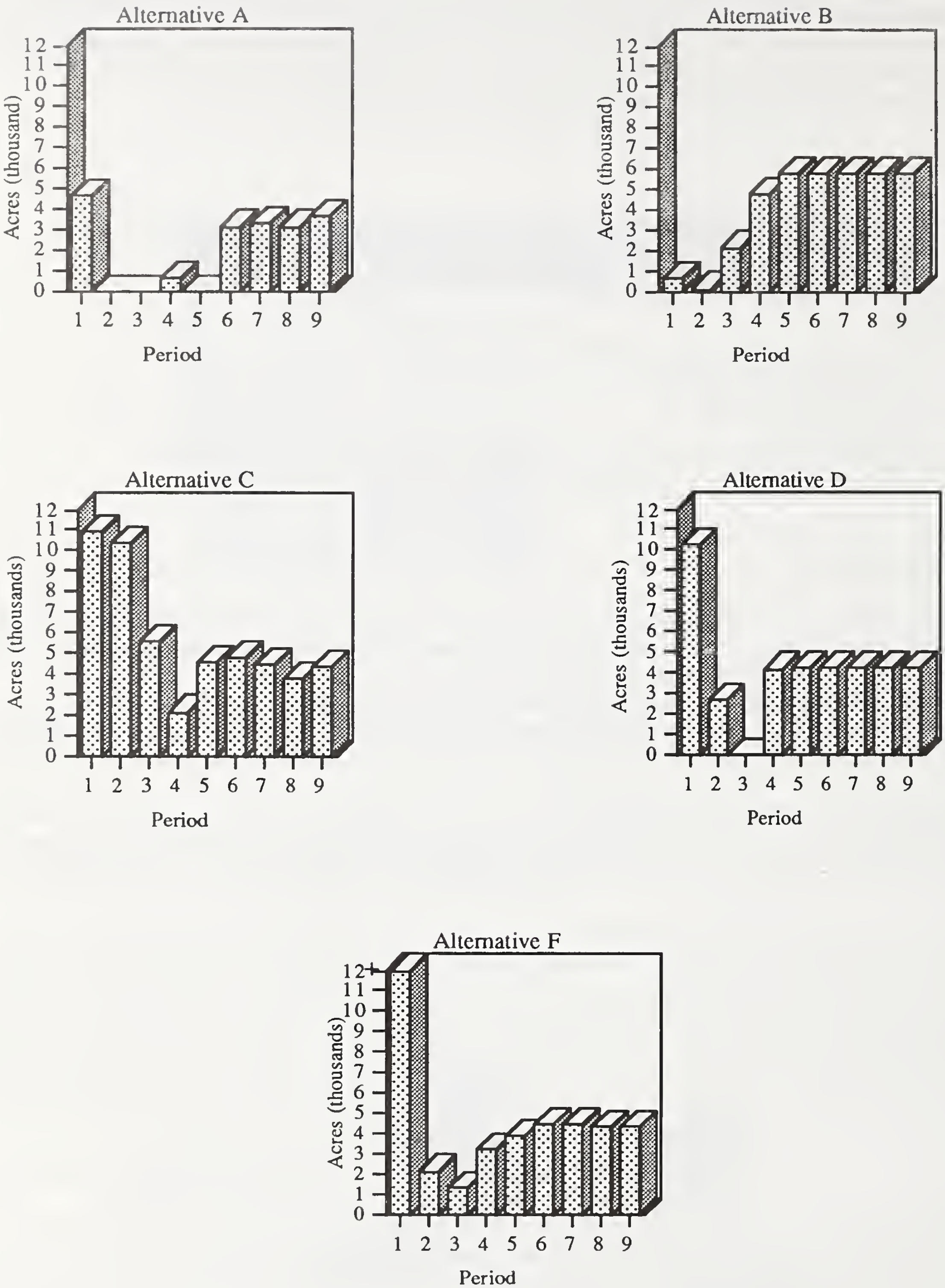


Figure II-5. Average number of acres of early successional habitat as a result of prescribed burning regeneration and scheduled pine regeneration harvest by 10 year period.

Late Successional Habitat

Just as early successional habitat is vital for many wildlife species and communities, many species are also dependent on late successional habitat. Tables II-11 and 12 show the acreage and percentage of each forest type by alternative designated as late successional habitat or potential late successional habitat. Potential late successional habitat includes stands which are at least 90 years old and areas which are classified as not suitable for timber production. This potential late successional habitat constitutes management areas 2, wilderness areas; 4, Guilliard Lake RNA; 8, unique areas; and 23 and 29, low disturbance areas found in alternatives D and F respectively. Since the entire Forest in alternative A is classified as not suitable for timber production, all but the scheduled conversion acres are included in the potential late successional habitat

As the result of no scheduled timber harvest in the hardwood areas, almost all of the hardwood type and most of the mixed type fall into the late successional habitat classification in the long term (Table II-12). Although alternative F contains the most acres in mixed type, it has the lowest percentage of late successional habitat for this type. This is because the stands converted to mixed management are still relatively young.

Table II-11. Potential late successional habitat by species for short term.

	Alternative									
	A		B		C		D		F	
Forest Type	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)
Pine	144,616	(91%)	3,324	(2%)	3,414	(2%)	12,271	(7%)	4,065	(3%)
Mixed	9,818	(100%)	2,272	(23%)	2,289	(23%)	3,002	(31%)	2,531	(26%)
Hardwood	65,357	(100%)	19,442	(30%)	19,442	(30%)	22,292	(34%)	24,034	(37%)
Total Forested Acres	219,791	(94%)	25,038	(11%)	25,145	(11%)	37,565	(16%)	30,630	(13%)

Table II-12. Potential late successional habitat by species for long term.

	Alternative									
	A		B		C		D		F	
Forest Type	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)	Acres	(% of forest type)
Pine	101,982	(64%)	61,040	(38%)	76,162	(48%)	67,109	(42%)	59,699	(39%)
Mixed	9,818	(100%)	9,818	(100%)	0	(0%)	9,818	(100%)	9,818	(66%)
Hardwood	65,357	(100%)	65,357	(100%)	65,357	(87%)	65,357	(100%)	65,357	(100%)
Total Forested Acres	177,157	(76%)	136,215	(58%)	141,519	(61%)	142,284	(61%)	134,874	(58%)

Species Composition—Hardwood Component

The amount of hardwood found on the Francis Marion is influenced by the soil type, intensity of site preparation and timber stand improvement operations, frequency and intensity of prescribed fire, the size and number of RCW clusters, protective measures used to maintain inclusions and transitions, and the conversion of hardwood types and mixed stands. Species composition is further discussed under issue 12, Distribution and Mix of Tree Species; however, this section will concentrate on the hardwood component and areas converted to longleaf and mixed stands.

Figure II-7 shows the changes in species composition from the present to the long term. All alternatives have the same species composition in the present. In the long term, however, the species composition varies among most alternatives. In all alternatives, the management of midstory hardwoods within red-cockaded woodpecker clusters will be similar. Prescribed burning is emphasized in all alternatives in pine types within the habitat management area. The difference in alternative species composition is related to how hardwood inclusions and transition areas are managed within the habitat management area and how these areas and pine stands are managed outside the habitat management area. Alternative B does not schedule any conversions, so species composition remains the same as the present. In alternatives A, C, D, and F longleaf pine type increases and loblolly pine type decreases. Alternative F shows an increase in the mixed forest type for the long term. Mixed stands are converted to bottomland hardwoods in alternative C.

The amount of hardwoods within stands helps describe the composition of each stand. The hardwood component is greatly influenced by the frequency and the intensity of prescribed burning. A more detailed discussion of prescribed fire is found under issue 11, Prescribed Burning; however, a summary of the hardwood component follows. With the aggressive growing season burning program, the hardwood component in alternative A will decrease over time. To be consistent with the more intensive timber management associated with alternative B, hardwoods are kept to a minimum in pine stands except for some key inclusions. Alternative C calls for the maintenance of hardwoods up to 30 percent in pine stands. Alternatives D and F encourage mast-producing hardwoods and offer corridors between some wilderness areas in which hardwoods dominate these areas of low disturbance. (For a visual display of relative hardwood component among alternatives, see issue 12, Distribution and Mix of Tree Species.)

Mast-producing Hardwoods

The amount of mast (acorns, nuts, seeds, berries, and other fruit) producing hardwoods is of particular concern. In the next 10 years there is little difference in the amount of mast-producing hardwoods among the alternatives; however, in the long term, differences are evident. The amount of mast-producing hardwoods depends on many factors such as fire regime, site preparation intensities, use of herbicides, and other silvicultural treatments. Figure II-6 illustrates the relative, long term number of mast-producing hardwoods by alternative. There is some component of hardwood in almost all forest types; however, the amount that contributes to mast production varies by forest type. Hard mast such as acorns and hickory nuts generally are not produced until stands are about 30-40 years old.

Alternative A has the least number of mast-producing hardwoods because of the high emphasis on growing season burns. Alternatives B and C have similar amounts of mast producers. In the long term, alternative F has the highest amount of mast-producing hardwoods. This results from the increased protection of transition areas and hardwood inclusions, and the encouragement of hardwoods on portions of the Forest. Alternative F also proposes some conversion of pine to mixed stands. Although alternative D also protects some key hardwood areas and transitions, it has more prescribed fire than alternative F, and the number of hardwoods that are capable of producing mast is probably lower.

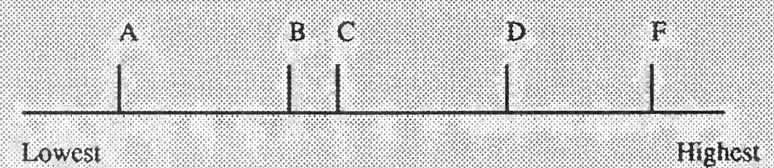


Figure II-6. Relative number of mast producing hardwoods in the long term by alternative.

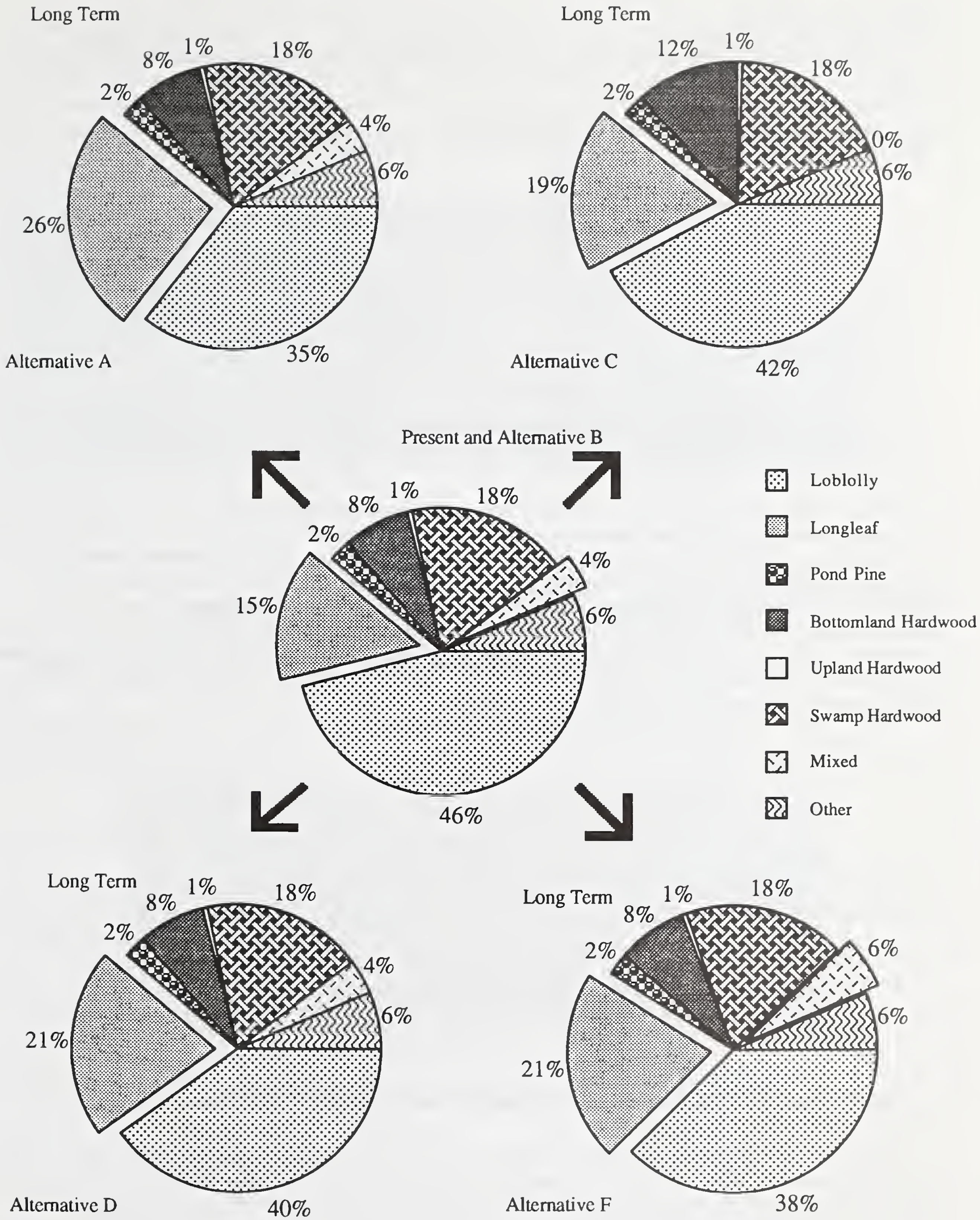


Figure II-7. Species composition for present and long term. (Alternative B does not have any scheduled conversions; therefore, it is the same as current.)

Wildlife Populations

A variety of wildlife species can be found in most forest age classes and forest types. Within each forest type, all terrestrial species appear to be dependent on either early succession, or late succession, or are adaptable to a range of age classes and/or forest type (generalists) (Stewart, 1985). Figure II-8 illustrates relative ranking of the alternatives in relation to their emphasis on early verses late successional stage dependent species. This ranking is a long-term analysis which results from the management strategies as outlined in each alternative.

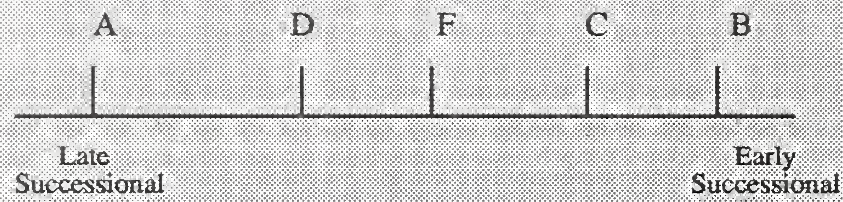


Figure II-8. Relative ranking of management strategies and their benefit to early versus late successional dependent species by alternative.

With the requirements for older pines needed for red-cockaded woodpecker management, there is a general shift for a large portion of the Forest to support late successional habitat.

Habitat manipulations will affect both game and non-game wildlife species. However, certain activities may emphasize the management of game or non-game species. Constructing and maintaining wildlife openings are often thought to be management for game species. Table II-10 shows the emphasis on wildlife openings and how they compare among alternatives. Establishing travel corridors and transition areas is often attributed to management for non-game species. Alternatives D and F propose corridors linking wilderness areas. Alternatives A, D and F also emphasize the opportunities for wildlife viewing and interpretive areas. Figure II-9 illustrates the relative ranking of the alternatives in relation to their emphasis on game or non-game species.

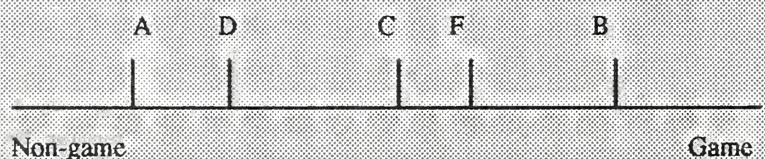


Figure II-9. Relative ranking of emphasis placed on the management of game versus non-game wildlife species by alternative.

7. Protection of Threatened, Endangered and Sensitive Plants and Animals

The acronym PETS applies to proposed, endangered, threatened and sensitive species. A proposed species is one which data supports its listing as a federally threatened or endangered species. An endangered species is a species which is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species that is likely to become endangered in the foreseeable future. (Definitions from 16 U.S.C. -1532.) All endangered and threatened species are protected under the Endangered Species Act (ESA) of 1973 (16 U.S.C. - 1531-1544). Those species designated as sensitive are managed in accordance with the Forest Service Manual (FSM), Title 2600. The Forest Service Manual (2670) defines sensitive species as "...those plant and animal species identified by a Regional Forester for which population viability is a concern...." This usually includes species which are candidates for threatened or endangered and species which are a concern for the state and may be listed under state law.

Management for PETS species in all alternatives will be consistent with ESA and Forest Service Manual (FSM) direction. In all alternatives, the Forest is committed to recovery of threatened and endangered, and management of sensitive species so that they will not become threatened or endangered. Management of these species is constant in all alternatives. However, potential impacts of proposed projects on PETS are analyzed and documented in site-specific evaluations.

The large number of clusters found on the Francis Marion means that management of red-cockaded woodpeckers influences many components of the Forest's ecosystem. Because of the magnitude of their potential impact on other resources, a range of possible management scenarios for red-cockaded woodpeckers was developed. Figure II-10 displays the approximate number of acres of pine and pine/hardwood forest types included in the habitat management area for RCWs. In alternatives A and D, the entire Forest is included in the habitat management area. This is an area where pine and pine/hardwood types are managed to support the population recovery objective for red-cockaded woodpeckers. Three-fourths of a mile buffers around each cluster are connected to create the HMA in alternatives B and F. Alternative C uses the 3/4 mile buffer around each cluster with no connection.

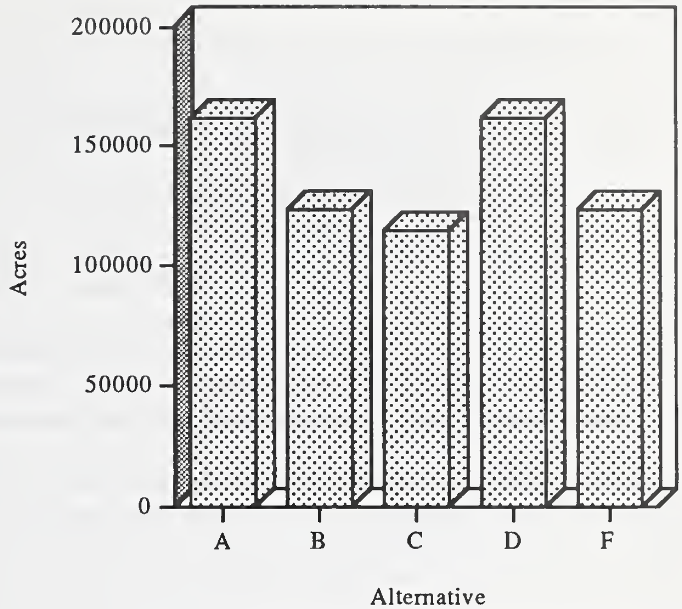


Figure II-10. Acres of pine and pine/hardwood under RCW management.

8. Timber Management Strategy and Volumes Offered

Alternatives are compared using 1) amount of lands designated as being suitable for timber production, 2) the Allowable Sale Quantity (ASQ), and 3) system of forest management available on suitable lands in terms of even-aged or uneven-aged methods of harvest.

Suitable for Timber Production

Areas designated as suitable for timber production are forested lands determined to be needed to meet forest plan timber management goals and objectives. These lands serve as a basis for determining the allowable sale quantity and the long-term sustained-yield timber capacity.

The level that may be sold for a specific time period as designated by the alternative is called the Allowable Sale Quantity (ASQ) and is expressed as a periodic amount. The highest uniform level of wood products that is sustainable over time is called the Long-term Sustained-yield Timber Capacity (LTSYC).

A three stage analysis process is used to designate suitable lands. Table II-13 is a summary of the suitability classifications. The first stage classified areas as Unsuitable for Timber Production such as non-forest, wilderness, or other areas administratively withdrawn by the Secretary of Agriculture or the Chief of the Forest Service.

The second stage determined that all forest conditions can contribute a positive value to the timber management program.

Table II-13. Summary of the acres designated as unsuitable for timber production, not appropriate for timber production (common to all alternatives and varied), and suitable for timber production.

	Alternative				
	A	B	C	D	F
Total Forest	249,503	249,503	249,503	249,503	249,503
Unsuitable for Timber Production	27,920	27,920	27,920	27,920	27,920
Not Appropriate for Timber Production	221,583	15,635	18,386	28,240	20,762
Suitable for Timber Production					
Loblolly and Longleaf Pine	0	142,499	142,599	134,326	141,743
Hardwood and Pond Pine	0	63,449	60,598	59,017	59,078
Total Suitable	0	205,948	203,197	193,343	200,821

The third stage designated additional areas as Not Appropriate-Varied and is based on the goals and objectives of each alternative. These include unique botanical, historical and geological areas or areas with special objectives which exclude timber production. The remaining areas are classified as suitable for timber production.

Hardwood and pond pine areas in the suitable base have not been included in the calculation of allowable sale quantity or long-term sustained yield timber capacity. They have not been scheduled because of relatively low product values, high logging costs, high cost of mitigating measures and a concern for the effects on wetlands and wildlife habitat.

Amount of Wood Products Offered

A sustainable level of wood products is managed only on lands designated as suitable for timber production. The allowable sale quantity depends on the desired future condition, goals, and objectives as set forth in the various alternatives.

Although wood products may be sold from lands designated as unsuitable or not appropriate for timber production, they may only be sold in order to meet non-timber related goals and objectives or from salvage operations due to insect, disease, wind, fire, or storm damage. The volume of wood products from these areas will not contribute to the attainment of the allowable sale quantity. Alternative A has no lands classified as suitable for timber production. However, there are planned conversions of loblolly pine to longleaf pine and harvests for red-cockaded woodpecker habitat. Periodic volume estimates from these harvests for short-term and long- term sustained yield timber capacity are 4,000 and 44,200 MCF respectively. Additional periodic harvest volume estimates from lands managed for red-cockaded woodpecker habitat management are 1,100 MCF for periods 1 through 9 in alternative D and 6,800 MCF for periods 1 through 9 in alternative F.

Table II-14 compares the estimated allowable sale quantity and long-term sustained yield timber capacity volumes from lands designated as suitable. (See Appendix B for additional details.)

Table II- 14. Periodic Allowable Sale Quantity (ASQ).

	Alternative				
	A	B	C	D	F
Period	Thousand Cubic Feet (MCF)				
1	0	30,700	32,700	28,300	30,200
2	0	28,800	22,000	19,900	21,000
5	0	86,700	58,400	68,200	60,400
Long Term	0	86,700	58,400	69,100	63,400

*Alternative A has no suitable lands.

System of Forest Management

Comparisons of the alternatives show differences in the system of forest management on the suitable lands and include 1) even-aged and uneven-aged regeneration methods, 2) rotation age, 3) estimated amount of regeneration harvests, and 4) the level of clearcutting allowed.

Even-aged and Uneven-aged Methods of Harvest

Many factors, both biological and social, need to be considered when selecting the harvest method to regenerate forested areas under even-aged or uneven-aged systems. These factors can be considered only at a site- specific level. However, based on the desired future condition, goals, and objectives of the alternatives, a discussion follows on the timber management direction for the lands designated as suitable for timber production in relation to uneven-aged or even-aged management.

A major consideration in the application of uneven-aged methods for all alternatives is the soil drainage conditions on the Forest. Soils classified as very poorly, or poorly drained are unlikely to be under uneven-aged management. This is based on the increased frequency of harvesting operations needed to maintain the desired stand structure. This increased frequency will result in greater risk of soil damage on these wetter soils. These areas were excluded from uneven-aged modeling in all alternatives. The actual determination of where to harvest will be based on a site-specific analysis.

Another major consideration is the proximity of an area to red-cockaded woodpecker clusters. Based on the R-8 Red-cockaded Woodpecker EIS and Walker and Escano, 1991, uneven-aged stands generally provide less foraging and potential nesting habitat. Uneven-aged management is not excluded for red-cockaded woodpecker management; however, it was not modeled within 1/2 mile of red-cockaded woodpecker clusters. The decision to implement uneven-aged or even-aged management is based on a site-specific analysis.

Alternative A has no designated suitable acres. Areas may appear to be even-aged or uneven-aged in structure as a result of management for other resources or by natural disturbances.

Alternatives B and C emphasize the use of even-aged management. Although uneven-aged management is not excluded, the obtainment of the timber objectives within these alternatives is not efficiently achieved with uneven-aged management.

Alternatives D and F emphasize the use of uneven-aged management on areas outside 3/4 miles from red-cockaded woodpecker clusters and on sites that have well, moderately well, and somewhat poorly drained soils.

Rotation Ages and Regeneration Harvests

Planned regeneration and establishment of forested stands are necessary to meet sustainable levels of wood product and wildlife habitat objectives. Rotation ages are used as a scheduling tool for regeneration harvest, and they affect the area in each age class, size and number of trees, and age of the oldest trees.

Table II-15 shows the range of rotation ages inside and outside areas managed for the red-cockaded woodpecker and the estimated periodic regeneration harvests by alternative.

Table II-15. Rotation ages inside and outside red-cockaded woodpecker habitat management areas (RCW--HMA) and estimated acres of regeneration harvests.

	Alternative				
	A	B	C	D	F
Rotation Age Inside RCW Habitat Management Area					
Loblolly	150	100	120	100-150	100-150
Longleaf	200	120	120	120-200	120-200
Rotation Age Outside RCW Habitat Management Area					
Loblolly	None	50	45-60	None	60
Longleaf	None	60	80	None	70-120
Forest-wide Planned Regeneration Harvest Acres					
Period 1	0	2,071	3,120	0	1,374
Period 5	0	17,352	13,810	12,886	11,629
Long Term	11,015	17,352	13,194	13,026	13,233

Clearcutting

As discussed in the Even-aged and Uneven-aged Methods of Harvest section, the selection of the method of timber harvest is a site-specific decision. However, because of national concerns over the use of clearcutting as a regeneration method, the Chief of the Forest Service included in his policy statement on Ecosystem Management criteria for clearcutting use. All alternatives incorporate that policy (Appendix G).

The only planned use of clearcutting is for converting loblolly pine to longleaf pine. The levels of conversion which may use clearcutting as well as levels converted by non-harvest methods are shown in Table II-16.

Table II-16. Acres of loblolly pine converted to longleaf pine for alternatives A, C, D and F. (No conversions scheduled for alternative B.)

Period	Alternative			
	A	C	D	F
1*	13,979	0	6,200	7,336
1	0	0	0	405
2	0	0	0	143
3	0	0	0	1,255
4	0	1,387	1,531	1,183
5	0	1,471	1,531	1,183
6	3,240	1,657	1,531	1,247
7	3,240	1,732	1,531	1,404
8	3,240	1,732	1,531	1,183
9	3,010	1,597	1,531	1,183
Total Conversion	26,709	9,576	15,386	16,522
Total Longleaf Pine	63,689	46,556	52,365	53,501

* Acres converted by non-harvest methods.

9. Corridors Connecting Wilderness Areas

Alternatives D and F have management areas connecting several of the wilderness areas. In alternative D, management area 23 serves as a corridor of special management between Wambaw Creek Wilderness, Wambaw Swamp Wilderness, and Little Wambaw Swamp Wilderness. This area comprises 13,234 acres. This delineation was based on the Roadless Area Review. (See alternative D map.) Alternative F includes an area, management area 29, which connects all of the wilderness areas and comprises 20,815 acres. Management area 29 was delineated by landtype associations. (See alternative F Map.) Management areas 23 and 29 provide semiprimitive motorized recreational opportunities and have some areas not suitable for timber production. Prescribed fire and timber harvest are allowed in these areas to meet red-cockaded woodpecker habitat needs and to minimize fire hazards.

Although alternative A does not delineate a management area specifically for a corridor between wilderness areas, such a corridor is inherent in the desired future condition of alternative A. In this alternative, the entire Forest is unsuitable for timber production. There may, however, be some conversions to longleaf (primarily in management area 19) and some other harvests and thinnings to support red-cockaded woodpecker habitat needs. Most of the Forest will have little disturbance except for prescribed fire.

Alternatives B and C do not set aside any specific area to connect wilderness areas. Since hardwood timber management has been deferred in all alternatives, some of the wilderness areas will be linked with corridors characterized by swamp and bottomland hardwoods although no special management is directed for these areas.

10. Herbicides

Alternatives are compared by discussing the management direction on whether to allow or not allow the use of herbicides. The relative ranking of potential herbicide use for the alternatives is displayed in Figure II-12. The decision to use a herbicide treatment where allowed is a site-specific decision. The amount (pounds per acre), method or technique of application (broadcast, strip, spot, or individual tree), and area treated are also site-specific decisions. All applications will be done according to the standards established in the Record of Decision for the R-8 Final Environmental Impact Statement for Vegetation Management in the Coastal Plain/Piedmont (FEISVM).

All Alternatives — Herbicide use will be allowed in the Seed Orchard, progeny test sites, Santee Experimental Forest, and unique botanical areas as determined on a site-specific basis. No herbicide use will be allowed within wilderness areas.

Additional direction by alternative.

Alternative A — No herbicides will be allowed.

Alternatives B and C — Herbicide use is allowed forest-wide. Greatest potential for use is in areas managed for timber objectives and red-cockaded woodpecker habitat needs.

Alternative D — Herbicide use is not allowed in the areas linking wilderness areas (management area 23) (13,234 acres). Use is allowed in all other areas to meet alternative objectives. Potential use is increased by the emphasis on uneven-aged management.

Alternative F — Herbicide use is not allowed in the area linking wilderness areas (management area 29) (20,815 acres). Use is allowed in all other areas to meet alternative objectives. There is lower potential for use than in alternative D due to emphasizing a greater component of hardwoods within pine stands and development of mixed species stands.

11. Prescribed Burning

Alternatives are compared by displaying the estimated annual short-term (periods 1 and 2) prescribed burning program and the desired long-term program for each alternative. A distinction is made between the short-term and long-term due to current forest conditions and operational limitations. Short-term burning levels are lower than long-term because of forest fuel conditions. Heavy fuel loading conditions caused by Hurricane Hugo will make burning more difficult in the short term. Fires will be harder to control and will emit more smoke and particulates. Smoke management guidelines will limit the allowable burning. As the fuel conditions change through time and burning is applied, some alternatives increase the level of burning in the long term. In all alternatives, burning is a high priority in the red-cockaded woodpecker habitat management areas.

The objectives of prescribed burning include woody and herbaceous fuel burning to reduce wildfire risks to forest resources and the public, preparing sites to establish and develop seedlings, producing vegetative conditions favoring certain species of wildlife, and restoring and maintaining certain fire-dependent, native vegetative communities.

Figure II-11 compares the annual amount of prescribed burning and the estimated proportion to be conducted during the growing and non-growing seasons in the short-term. Figure II-12 compares the same for the long-term program.

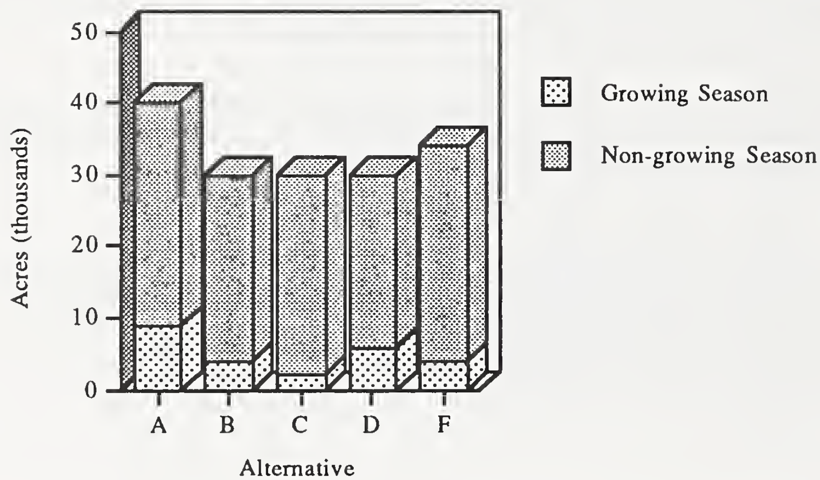


Figure II-11. Short-term (periods 1 and 2) prescribed burning program with growning and non-growing season burns.

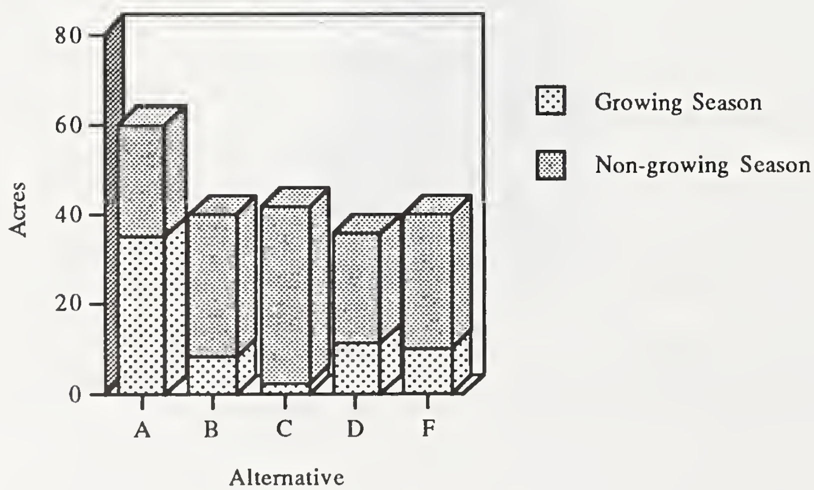


Figure II-12. Long-term prescribed burning program with growing and non-growing season burns.

Alternative A, emphasizes the extensive use of growing season burns to restore and maintain the fire- dependent, native communities of the longleaf ecosystem. Growing season burns are desired on the drier sites and wet inclusions at least every 2 or 3 years. Burns in the more expansive wetter pine sites are desired on a 3 to 5 year cycle to provide natural communities on these sites.

Alternative B emphasizes using non-growing season burns to reduce risk of wildfire damage to forest resources and to the public, and to maintain red-cockaded woodpecker habitat. Growing season burns are used only to prepare sites for establishing and developing seedlings; to maintain existing fire-dependent, native communities; and to increase fire-dependent, native communities.

Alternative C shows the current level of prescribed burning. The objectives of burning are the same as for alternative B except there is no emphasis to increase fire-dependent communities.

In alternative D, growing season burns are slightly increased over alternative B to reflect a higher emphasis on expanding fire-dependent, native communities.

Alternative F has the lowest level of burning reflecting the emphasis to provide a higher level of within pine stand hardwood component outside the HMA, to protect hardwood inclusions and transition zones, and to develop mixed stands. The growing season burns are the same level as D to reflect an emphasis on expanding native, fire-dependent communities.

12. Distribution and mix of Tree Species

The alternatives are compared by (1) discussing how the hardwood component within pine stands will be managed, (2) highlighting special measures for hardwood protection or encouragement in inclusions and transition zones, (3) displaying the differences in the forest cover types for each alternative, and (4) the management of mixed pine/hardwood stands on the Forest.

Hardwood Component within Pine Stands

The hardwood component in pine stands varies primarily as a result of the prescribed burning program established to meet objectives such as managing red-cockaded woodpecker habitat, restoring or maintaining fire dependent communities, reducing fuels to reduce risk of wildfires and preparing sites to establish and develop seedlings. Generally, growing season burns and high fire frequencies cause reduced levels of hardwoods within pine stands.

Other factors include the intensity of site preparation or intermediate stand treatments such as release, and pre-commercial or commercial thinnings.

Figure II-13 shows a general ranking of the overall hardwood component of each alternative. This ranking is an analysis which incorporates the many factors discussed above and how they influence the relative level of hardwoods within pine stands over the entire forest. Hardwood in the midstory of pine stands near and within RCW clusters will be reduced in all alternatives.

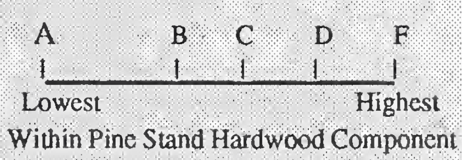


Figure II-13. General ranking of the hardwood within pine stands by alternative.

Management to Protect or Encourage Hardwoods in Transition Zones or Inclusions

Each alternative provides some level of protection to hardwoods for wildlife habitat or diversity needs. The focus of this section is on mast-producing trees found along transition zones between the uplands and lowlands, and inclusions within pine stands. The method to protect these areas from fire induced mortality is a site-specific decision and will, therefore, vary from area to area. Some examples of possible protection methods are allowing prescribed fires under certain low-intensity conditions, excluding fire by constructing fire lines, limiting access, or restricting harvesting operations within or adjacent to these areas.

A narrative on the management of these zones and inclusions by alternative for comparison follows.

Alternative A—No special management in transition zones or inclusions. The number of hard mast-producing trees within these areas depends on natural barriers from fire such as depressions, streams, and bogs. Hard mast will probably decrease over time.

Alternative B— Key transition zones and inclusions with a significant component of hard mast are protected from fire and other activities. Designation of protected areas is based primarily on game habitat needs.

Alternative C—same as B.

Alternative D—Existing hard mast inclusions, except in longleaf pine communities, have a high level of protection. Transition zones throughout the forest are protected.

Alternative F—Protection of existing zones and inclusions is the same as Alternative D. Greater emphasis is placed on increasing hard mast component in transition zones by planting mast producers or using other treatments.

Forest Cover Types

Table II-17 displays the changes in forest cover type by alternative. Alternatives A, C, D, and F propose different levels of conversion of loblolly pine to longleaf pine. Alternatives B proposes no conversion. Table II-16 shows the estimated acreage and timing of the conversions to longleaf.

Mixed forest cover types are a 30-70 percent mixture of pine and hardwoods species.

Table II-17. Current and long-term acreage and percentage of Forest for loblolly pine, longleaf pine, mixed types and bottomland hardwoods.

	Current		Long-term							
			Alternative							
			A		C		D		F	
Species	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)
Loblolly Pine	114,917	(46)	88,209	(35)	105,342	(43)	99,531	(40)	93,380	(37)
Longleaf Pine	36,980	(15)	63,688	(26)	46,555	(19)	52,365	(21)	53,201	(26)
Mixed Type	9,818	(4)	9,818	(4)	0	(0)	9,818	(4)	14,833	(6)
Bottomland Hardwoods	18,975	(8)	18,975	(8)	28,798	(12)	18,975	(8)	18,975	(8)

Alternative F proposes the conversion of loblolly pine stands to mixed stands in certain areas in the Forest.

Table II-18 displays the estimated acreage and timing of these conversions. Alternative C proposes the conversion of all mixed stands to hardwoods. Site specific RCW foraging needs will be analyzed prior to any conversion of pine stands.

Table II-18. Acreage of existing loblolly pine converted to mixed types by period for alternative F.

Period	Acreage	Period	Acreage
4	10	8	924
2	32	7	670
3	132	8	1,327
4	408	8	1,327
5	165	**Long-term Total**	**5,015**

13. Wetlands

Soils classified as very poorly or poorly drained are used to identify potential forested wetlands. The actual designation will be based on a site-specific analysis. Table II-19 shows the estimated regeneration harvest acres of loblolly pine on poorly and very poorly drained soils by alternative. As with the wetland designation, the decision to harvest a specific area is based on a site-specific analysis.

Table II-19. Regeneration harvest acres of poorly drained and very poorly drained loblolly pine by 10 year planning period and alternative.

	Alternative				
Period	A	B	C	D	F
1	0	841	2,000	0	608
2	0	564	1,436	0	726
3	0	2,695	4,954	0	2,364
4	2,115	2,342	3,669	4,290	4,623
5	0	3,474	9,870	6,041	5,197
6	5,615	9,245	10,818	6,363	6,425
7	5,615	12,731	8,382	8,107	7,255
8	5,615	4,986	5,654	6,113	5,508
9	5,615	4,172	8,074	6,470	6,547

Other planned activities that may affect wetlands are recreational facility and trail construction, road construction, cross country OHV use and fireline construction for prescribed burning.

Comparisons of these activities by alternative are found on the following pages:

Facility and Trail Construction, pages II-25 to II-27
OHV Use, II-29
Road Construction, II-29 to II-30
Prescribed Burning, II-42 to II-43

Table II-20 compares the potential for activity in wetlands by showing the amount of loblolly pine designated as Suitable for Timber Production on very poorly or poorly drained soils. Only the acreage in loblolly pine is displayed since no activities are scheduled in the pond pine or hardwood types and the amount of longleaf pine on these soils is negligible.

Table II-20. Loblolly pine classified as suitable for timber production on areas with very poorly and poorly drained soils.

	Alternative				
	A	B	C	D	F
Potential Wetlands as Suitable	0	51,875	51,875	47,784	45,266
Forest-wide Potential Wetlands	143,115	143,115	143,115	143,115	143,115
% of Potential Wetlands with Harvest	0	36	36	33	32

14. Revenue and Jobs

Each alternative has been evaluated to estimate its economic effect on the local community. Differences among the alternatives in timber harvest levels, development of recreational facilities, dispersed recreational opportunities, resource use fees, Forest Service expenditures, and 25 percent fund returns to the counties each contribute to the employment and income of the local area. Based on the economic structure of the Berkeley, Charleston, Dorchester, and Georgetown county area, job and income multipliers were developed. These multipliers were then applied to the various resource program levels of the alternatives to develop the job and income estimates displayed in Tables II-21 and 22.

Table II-21. Estimated average annual income in million $ produced from Forest Service activities by period in the four county area.

	Alternative				
	A	B	C	D	F
Period 1	5.6	7.3	7.0	6.9	7.3
Period 5	8.6	18.1	13.0	14.9	13.4
Long-term	10.8	17.7	12.3	15.0	13.9

Table II-22. Estimated average annual employment in jobs produced from Forest Service activities by period in the four county area.

	Alternative				
	A	B	C	D	F
Period 1	228	299	287	283	297
Period 5	367	772	554	636	570
Long-term	461	753	519	639	591

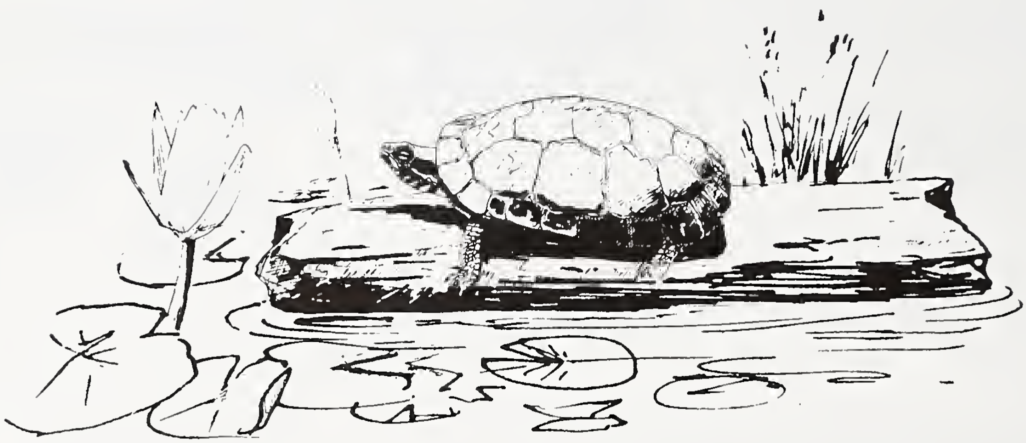
The present net value of the alternatives was estimated using the discounted costs and benefits over a 90-year planning period. Benefits included estimated timber sale receipts, wildlife and fish user day values and recreational visitor day values. The values used were those listed on page B-41. Estimated costs included the estimated budget to fully implement the alternatives. All alternatives include the cost of construction and maintenance of the Sewee Visitor Center and there are substantial costs associated with fire protection and wildlife management in relation to threatened and endangered species such as the red-cockaded woodpecker. Table II-23 shows the estimated PNV for the alternatives for various 10-year periods. Due to the costs of management, the high capital investment in recreational construction and the low level of timber receipts the first few periods, the PNV is negative throughout the planning portion in all alternatives. In most alternatives, receipts begin to exceed costs in the fourth period as more sawtimber volume becomes available. This positive income is not enough to recover the early negative income when discounted.

Table II-23.	Net revenue and Present Net Value (PNV) in thousand $ of the alternatives.				
Period 1 (10-year Totals)					
	Alternative				
	A	**B**	**C**	**D**	**F**
Timber Benefits	16,617	20,292	22,141	16,618	16,617
Wildlife Benefits	2,933	2,261	2,267	2,116	2,013
Recreation Benefits	4,700	5,638	4,700	5,970	6,290
Timber Costs	5,703	7,928	8,298	6,197	6,380
Wildlife Costs	10,800	14,390	14,390	14,390	14,390
Recreation Costs	10,730	16,890	10,730	18,190	18,800
Other Costs*	20,820	27,820	27,820	27,350	26,870
Net Revenue	**-24,608**	**-38,837**	**-32,130**	**-41,423**	**-41,520**
PNV Cumulative	**-20,226**	**-31,921**	**-26,409**	**-34,047**	**-34,126**
Period 5 (10-year Totals)					
Timber Benefits	43,851	109,686	72,200	84,040	71,476
Wildlife Benefits	2,078	2,025	1,997	2,052	1,977
Recreation Benefits	5,365	6,843	5,365	7,000	7,355
Timber Costs	7,585	35,485	24,191	29,478	23,159
Wildlife Costs	11,000	10,000	10,400	9,000	8,000
Recreation Costs	7,070	7,800	7,070	8,170	9,700
Other Costs*	16,780	22,590	22,590	22,220	21,840
Net Revenue	**8,859**	**42,679**	**15,311**	**24,224**	**18,109**
PNV Cumulative	**-37,563**	**-33,336**	**-38,589**	**-47,207**	**-47,791**
Period 9 (10-year Totals)					
Timber Benefits	57,940	100,956	72,200	82,157	73,678
Wildlife Benefits	1,928	1,845	1,997	1,871	1,876
Recreation Benefits	5,365	6,843	5,345	7,000	7,355
Timber Costs	22,347	39,240	24,191	32,275	28,032
Wildlife Costs	13,000	10,000	10,400	9,000	8,000
Recreation Costs	7,070	7,800	7,070	8,170	9,700
Other Costs*	14,780	22,590	22,590	22,220	21,840
Net Revenue	**8,036**	**30,014**	**5,827**	**19,363**	**15,337**
PNV Cumulative	**-36,638**	**-26,192**	**-36,718**	**-42,416**	**-43,627**

*Other costs include fire protection, land acquisition, engineering, general administration, seed orchard operation, minerals management, law enforcement and soil and water management.

Chapter III

The Affected Environment and Environmental Consequences



The Affected Environment and Environmental Consequences

The affected environment is the physical, biological, economical and social components of the human environment which forest management may change. This chapter describes the current condition of these components and how they may be affected by implementing the various alternatives.

To achieve desired objectives and conditions of the alternatives, certain probable activities will occur. The location, design and extent of such activities are generally not known at this time. That will be a site-specific (project by project) decision. Before implementing any of the activities, a site-specific environmental analysis will be conducted. The discussion in this chapter refers to the potential for the effect to occur, realizing that these are estimates. The effects of the alternatives are analyzed in relation to the effects of these probable activities and their variation among the alternatives. A list and definition of the most significant probable activities are found in Appendix B. This is not a complete listing of all possible activities which may occur in the alternatives. This list is an estimate of the most significant probable activities. Tables III-1a, b and c show the variation in probable activities and outputs in various 10 year periods through the planning horizon. These tables will be referred to throughout the effects analysis.

Irreversible/Irretrievable Commitments

Irreversible and irretrievable commitments of resources are not usually made at the programmatic level of a Forest Plan. Irreversible commitments are decisions affecting non-renewable resources such as soils, minerals and cultural resources. Such commitments of resources are considered irreversible because the resource has been destroyed, removed or has deteriorated to the point that renewal can occur only over a long period or at great expense. The actual commitment to develop, use or affect non-renewable resources is made at the project level.

Irretrievable commitments represent resource uses or opportunities which are foregone or cannot be realized during the planning period. These decisions are reversible, but the production opportunities foregone are irretrievable. An example is the allocation of management prescriptions that do not allow timber harvests where the trees could have been part of the suitable base. For the period these allocations are made, the opportunity to produce timber from these areas is foregone. Irreversible and irretrievable commitments are not specifically identified in the discussions in this chapter.

Mitigating Measures

Mitigation measures are applied to avoid, minimize, rectify, reduce, eliminate or compensate for possible adverse environmental effects. Many of the standards and guidelines for the preferred alternative, outlined in the Draft Forest Plan, Chapter III, serve to mitigate effects of management on changes in existing conditions.

Management activities in all alternatives would be governed by standards and guidelines, including State of South Carolina Best Management Practices (BMPs). BMPs are specifically designed to protect water quality as required by Section 208 of the Clean Water Act.

This analysis assumes that the activities will be conducted in compliance with all laws, regulations and policies governing activities on National Forest land. Most of these regulations and policies contain direction for mitigation of environmental effects. Examples include the Clean Air Act, Coastal Zone Management Act, the Endangered Species Act, National Historic Preservation Act and the Wilderness Act.

For definitions of these activities, see Appendix B.

Table III-1a. Probable activities for the first period.

	Alternative				
	A	B	C	D	F
Constructing Developed Recreational Facilities					
Number and Capacity (PAOTs) of Facilities Planned					
Boat Ramps	None	2 (150)	None	2 (150)	2 (150)
Horse Camps	None	1 (50)	None	2 (100)	2 (100)
Campgrounds	None	1 (400)	None	2 (500)	3 (600)
Canoe Access	None	None	None	2 (100)	5 (130)
Maintaining Developed Recreational Facilities					
Total Facilities and Capacity (PAOTs)					
Boat Ramps	5 (350)	7 (500)	5 (350)	7 (500)	5 (350)
Campgrounds	2 (100)	3 (500)	2 (100)	4 (600)	5 (700)
Hunt Camps	2 (145)	2 (145)	2 (145)	2 (145)	2 (145)
Picnic Areas	3 (180)	3 (180)	3 (180)	3 (180)	3 (180)
Rifle Ranges	2 (30)	2 (30)	2 (30)	2 (30)	2 (30)
Swimming Sites	1 (120)	1 (120)	1 (120)	1 (120)	1 (120)
Visitor Center	1 (689)	1 (689)	1 (689)	1 (689)	1 (689)
Constructing Trails					
Miles of Trail Construction by Type					
Motorcycle/ATV	0	20	0	20	20
Jeep	0	0	0	20	0
Bicycle	0	5	0	10	10
Canoe, non-motorized	0	10	0	10	10
Hiking	0	0	0	10	10
Horse	0	15	0	20	20
Maintaining Trails					
Total Miles of Trail byType					
Motorcycle/ATV	40	60	40	60	60
Jeep	0	0	0	20	0
Bicycle	0	5	0	10	10
Canoe, motorized/non-motorized	11.5	21.5	11.5	21.5	21.5
Hiking	20	20	20	30	30
Horse	18	33	18	38	38
Charging User Fees					
Ranking of Emphasis 0 = least; 5 = most	3	5	3	5	3
Closing Roads					
Miles of Closed Roads	247	90	169	191	196
Constructing Roads					
Miles of Road Constructed	11	15	12	16	15
Reconstructing Roads					
Miles of Road Reconstructed	63	66	59	56	63
Maintaining Roads					
Miles of Open Roads	367	528	446	428	422
Cross-country Motorized Vehicle Travel					
Ranking of Alternatives 0=most restrictive, 5=least restrictive	0	0	3	4	0

Table III-1a cont. Probable activities for the first period continued.

	Alternative				
	A	B	C	D	F
Constructing Wildlife Openings					
Acres of Wildlife Openings Constructed	0	100	0	0	100
Maintaining Wildlife Openings					
Total Acres of Wildlife Openings	0	810	710	710	810
Total Acres of ROW as Openings	105	120	135	150	165
Converting Pine Stands to Mixed Stands					
Acres of Pine Stands Converted to Mixed	0	0	0	0	0
Total Acres of Mixed Stands	9,800	9,800	0	9,800	9,800
Converting Loblolly to Longleaf Pine					
Acres of loblolly converted to longleaf*	14,000	0	0	6,200	7,700
Total Acres of Longleaf Pine	51,000	37,000	37,000	43,200	44,700
Harvesting Trees					
Acres of Regeneration Harvest†	0	2,100	3,100	0	1,400
Acres of Thinning Harvest◊	44,000	44,000	44,000	44,000	44,000
Establishing Regeneration					
Acres of Regeneration•	14,000	2,100	3,100	14,400	24,400
Acres of Fertilization	0	800	2,000	0	600
Prescribed Burning					
Annual Acres Burned	40,000	30,000	30,000	30,000	30,000
Winter Burns	31,000	26,000	28,200	24,000	26,000
Growing-season BurnsΔ	9,000	4,000	1,800	6000	4,000
Applying Herbicide					
Ranking of Alternative's Potential Herbicide Use 0=lowest, 5=highest	0	4	3	2	1
Timber Stand Improvement					
Acres of Precommercial Thinnings	10,000	25,000	25,000	20,000	18,000
Acres of Release	0	5,000	5,000	5,000	2,000
Managing Hardwoods in Pine Stands					
Ranking of within stand hardwood 0=lowest, 5= highest	0	2	3	4	5
Managing Transitions and Inclusions					
Ranking of Emphasis on Transition and Inclusion Management, 0=lowest, 5=highest	0	2	3	4	5

*Includes conversion by burning off-site loblolly regeneration and by harvest.

†Includes conversion harvest.

◊Includes 2,309 acres of uneven-aged management for Alternative D and 2,627 acres of uneven-aged management for Alternative B.

•Includes conversions by burning and delayed regeneration by burning.

ΔAlternative C growing season burns are done to maintain viable, fire dependent communities.

Table III-1b. Probable activities for the fifth period.

	Alternative				
	A	B	C	D	F
Constructing Developed Recreational Facilities					
Number and Capacity (PAOTs) of Facilities Planned					
Boat Ramps	None	None	None	None	None
Horse Camps	None	None	None	None	None
Campgrounds	None	None	None	None	None
Canoe Access	None	None	None	None	None
Maintaining Developed Recreational Facilities					
Total Facilities and Capacity (PAOTs)					
Boat Ramps	5 (350)	7 (500)	5 (350)	7 (500)	5 (350)
Campgrounds	3 (500)	4 (600)	3 (500)	5 (700)	3 (500)
Hunt Camps	2 (145)	2 (145)	2 (145)	2 (145)	2 (145)
Picnic Areas	3 (180)	3 (180)	3 (180)	3 (180)	3 (180)
Rifle Ranges	2 (30)	2 (30)	2 (30)	2 (30)	2 (30)
Swimming Sites	1 (120)	1 (120)	1 (120)	1 (120)	1 (120)
Visitor Center	1 (689)	1 (689)	1 (689)	1 (689)	1 (689)
Constructing Trails					
Miles of Trail Construction by Type Planned					
Motorcycle/ATV	0	0	0	0	0
Jeep	0	0	0	0	0
Bicycle	0	0	0	0	0
Canoe, non-motorized	0	0	0	0	0
Hiking	0	0	0	0	0
Horse	0	0	0	0	0
Maintaining Trails					
Total Miles of Trail byType					
Motorcycle/ATV	40	60	40	60	40
Jeep	0	0	0	20	0
Bicycle	0	5	0	10	0
Canoe, motorized, non-motorized	11.5	21.5	11.5	21.5	11.5
Hiking	20	20	20	30	20
Horse	18	33	18	38	18
Charging User Fees					
Ranking of Emphasis 0 = least; 5 = most	3	5	3	5	3
Closing Roads					
Miles of Closed Roads	247	90	169	191	196
Constructing Roads					
No significant amount planned in any alternative					
Reconstructing Roads					
Miles of Road Reconstructed	130	240	174	230	210
Maintaining Roads					
Miles of Open Roads	367	528	446	428	422
Cross-country Motorized Vehicle Travel					
Ranking of Alternatives 0=most restrictive, 5=least restrictive	0	0	3	4	0

Table III-1b cont. Probable activities for the fifth period continued.

	Alternative				
	A	B	C	D	F
Constructing Wildlife Openings					
Acres of Wildlife Openings Constructed	0	0	0	0	0
Maintaining Wildlife Openings					
Total Acres of Wildlife Openings	0	810	710	710	810
Total Acres of ROW as Openings	105	120	135	150	165
Converting Pine Stands to Mixed Stands					
Acres of Pine Stands Converted to Mixed	0	0	0	0	200
Total Acres of Mixed Stands	9,800	9,800	0	9,800	10,600
Converting Loblolly to Longleaf Pine					
Acres of loblolly converted to longleaf*	0	0	1,500	1,500	1,200
Total Acres of Longleaf Pine	51,000	37,000	39,800	44,700	48,500
Harvesting Trees					
Acres of Regeneration Harvest†	0	17,400	13,800	12,900	11,600
Acres of Thinning Harvest◊	44,700	40,800	32,400	40,900	37,600
Establishing Regeneration					
Acres of Regeneration•	0	17,400	13,800	12,900	11,600
Acres of Fertilization	0	3,500	9,900	6,000	5,200
Prescribed Burning					
Annual Acres Burned	50,000	40,000	42,000	35,000	30,000
Winter Burns	25,000	32,000	40,200	24,500	20,000
Growing-season BurnsΔ	25,000	8,000	1,800	10,500	10,000
Applying Herbicide					
Ranking of Alternative's Potential Herbicide Use 0=lowest, 5=highest	0	4	3	2	1
Timber Stand Improvement					
Acres of Precommercial Thinnings	0	10,000	7,000	6,500	5,500
Acres of Release	0	3,000	2,000	2,000	2,000
Managing Hardwoods in Pine Stands					
Ranking of within stand hardwood 0=lowest, 5= highest	0	2	3	4	5
Managing Transitions and Inclusions					
Ranking of Emphasis on Transition and Inclusion Management, 0=lowest, 5=highest	0	2	3	4	5

*Includes conversion by burning off-site loblolly regeneration and by harvest.

†Includes conversion harvest.

◊Includes 2,309 acres of uneven-aged management for Alternative D and 2,627 acres of uneven-aged management for Alternative B.

•Includes conversions by burning and delayed regeneration by burning.

ΔAlternative C growing season burns are done to maintain viable, fire dependent communities.

Table III-1c. Probable activities for the ninth period.	Alternative				
	A	B	C	D	F
Constructing Developed Recreational Facilities					
Number and Capacity (PAOTs) of Facilities Planned					
Boat Ramps	None	None	None	None	None
Horse Camps	None	None	None	None	None
Campgrounds	None	None	None	None	None
Canoe Access	None	None	None	None	None
Maintaining Developed Recreational Facilities					
Total Facilities and Capacity (PAOTs)					
Boat Ramps	5 (350)	7 (500)	5 (350)	7 (500)	5 (350)
Campgrounds	3 (500)	4 (600)	3 (500)	5 (700)	3 (500)
Hunt Camps	2 (145)	2 (145)	2 (145)	2 (145)	2 (145)
Picnic Areas	3 (180)	3 (180)	3 (180)	3 (180)	3 (180)
Rifle Ranges	2 (30)	2 (30)	2 (30)	2 (30)	2 (30)
Swimming Sites	1 (120)	1 (120)	1 (120)	1 (120)	1 (120)
Visitor Center	1 (689)	1 (689)	1 (689)	1 (689)	1 (689)
Constructing Trails					
Miles of Trail Construction by Type					
Motorcycle/ATV	0	0	0	0	0
Jeep	0	0	0	0	0
Bicycle	0	0	0	0	0
Canoe/non-motorized	0	0	0	0	0
Hiking	0	0	0	0	0
Horse	0	0	0	0	0
Maintaining Trails					
Total Miles of Trail byType					
Motorcycle/ATV	40	60	40	60	40
Jeep	0	0	0	20	0
Bicycle	0	5	0	10	0
Canoe, motorized/non-motorized	11.5	21.5	11.5	21.5	11.5
Hiking	20	20	20	30	20
Horse	18	33	18	38	18
Charging User Fees					
Ranking of Emphasis 0 = least; 5 = most	3	5	3	5	3
Closing Roads					
Miles of Closed Roads	247	90	169	191	196
Constructing Roads					
No significant amount planned in any alternative					
Reconstructing Roads					
Miles of Road Reconstructed	150	290	194	230	210
Maintaining Roads					
Miles of Open Roads	367	528	446	428	422
Cross-country Motorized Vehicle Travel					
Ranking of Alternatives 0=most restrictive, 5=least restrictive	0	0	3	4	0

Table III-1c. cont. Probable activities for the ninth period continued.	Alternative				
	A	B	C	D	F
Constructing Wildlife Openings					
Acres of Wildlife Openings Constructed	0	0	0	0	0
Maintaining Wildlife Openings					
Total Acres of Wildlife Openings	0	810	710	710	810
Total Acres of ROW as Openings	105	120	135	150	165
Converting Pine Stands to Mixed Stands					
Acres of Pine Stands Converted to Mixed	0	0	0	0	1,300
Total Acres of Mixed Stands	9,800	9,800	0	9,800	14,800
Converting Loblolly to Longleaf Pine					
Acres of loblolly converted to longleaf*	3,000	0	1,600	1,500	1,200
Total Acres of Longleaf Pine	63,600	37,000	46,500	52,400	53,500
Harvesting Trees					
Acres of Regeneration Harvest†	11,000	17,400	13,200	13,000	13,200
Acres of Thinning Harvest◊	2,100	32,000	22,500	22,900	17,300
Establishing Regeneration					
Acres of Regeneration•	11,000	17,400	13,200	13,000	13,200
Acres of Fertilization	0	4,200	8,100	6,500	6,500
Prescribed Burning					
Annual Acres Burned	60,000	40,000	42,000	35,000	30,000
Winter Burns	25,000	32,000	40,200	24,500	20,000
Growing-season BurnsΔ	35,000	8,000	1,800	10,500	10,000
Applying Herbicide					
Ranking of Alternative's Potential Herbicide Use 0=lowest, 5=highest	0	4	3	2	1
Timber Stand Improvement					
Acres of Precommercial Thinnings	0	10,000	7,000	6,500	7,000
Acres of Release	0	3,000	2,000	2,000	2,000
Managing Hardwoods in pine stands					
Ranking of within stand hardwood 0=lowest, 5= highest	0	2	3	4	5
Managing Transitions and Inclusions					
Ranking of Emphasis on Transition and Inclusion Management, 0=lowest, 5=highest	0	2	3	4	5

*Includes conversion by burning off-site loblolly regeneration and by harvest.

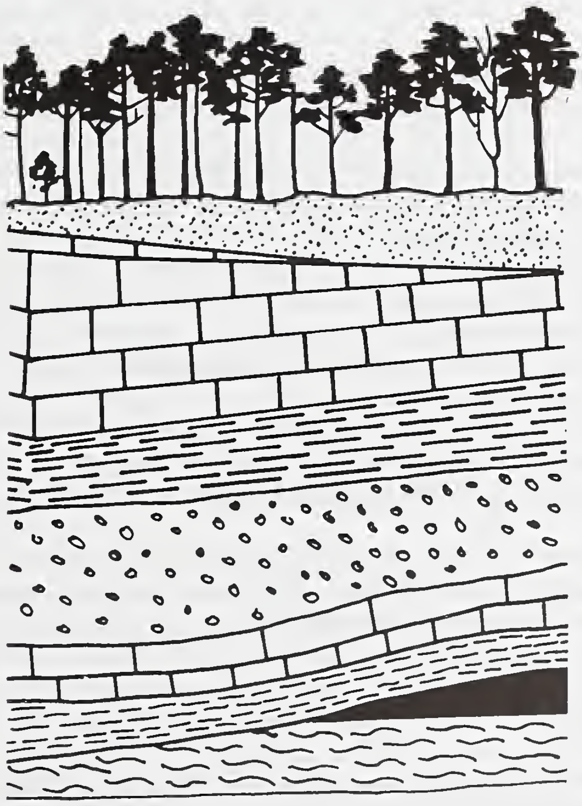
†Includes conversion harvest.

◊Includes 2,309 acres of uneven-aged management for Alternative D and 2,627 acres of uneven-aged management for Alternative B.

•Includes conversions by burning and delayed regeneration by burning.

ΔAlternative C growing season burns are done to maintain viable, fire dependent communities.

Physical Environment



Air

Current Condition

Three classes of air quality were established by the Clean Air Act Amendments of 1977. These classes are labeled I, II and III. Class I is the most restrictive for pollution increases allowed from new major stationary sources, and class III is the least restrictive. No area in the United States is designated as class III. All of the Forest is designated as Class II air quality. A Class I area, the Cape Romain National Wildlife Refuge, is located east of the Forest along the Atlantic coastline. According to the South Carolina Department of Health and Environmental Control (DHEC), there have been no violations of Federal air quality standards for any pollutant in Berkeley or Charleston county.

Environmental Consequences

Effects by Alternative

None of the probable activities conducted in any alternative is considered a new major stationary source of pollution. Management activities will not cause a violation of Federal air quality standards in any alternative.

Prescribed burning has more effect on air quality than any other probable activity. Prescribed burning emits a substantial amount of gases and particulate matter. Growing season burning tends to emit more smoke than similar winter burning due to higher moisture content of fuel. These effects will be of short duration and adherence to State of South Carolina Smoke Management Guidelines will mitigate the cumulative effects. The current heavy fuel loading (brush, slash and snags) on the Forest will result in higher average emissions per acre than past burning. In the long term, the emission per acres should decrease as the fuels move to a lighter fuel load (grasses and forbs). This effect will be greater in those alternatives emphasizing and expanding the longleaf ecosystem.

The exhaust gases and dust produced from all probable other activities will not be significant in any alternative given the size of the airshed and the small proportion of total exhaust gases and dust produced from Forest management activities in relation to all other sources.

Alternative A has the highest potential to affect air quality because this alternative has the highest level of probable annual prescribed burning in the short term, 40,000 acres, and the long term, 60,000 acres. Alternative A also has the highest proportion of annual growing season burns, 9,000 acres in the short term and 35,000 acres in the long term. This alternative has the highest relative change in emissions from current management levels than any alternative.

Alternative B has 30,000 acres of probable annual prescribed burning in the short term and 40,000 acres in the long term. Alternative B has 4,000 acres of annual growing season burning in the short term and 8,000 acres in the long term. This alternative has the second highest relative change in emissions from current management levels of the alternatives.

Alternative C has 30,000 acres of probable annual prescribed burning in the short term and 42,000 acres in the long term. Alternative C has 1,800 acres of annual growing season burning in both the short and long term. This alternative represents a continuation of current burning policy.

Alternative D has 30,000 acres of probable annual prescribed burning in the short term and 35,000 acres in the long term. Alternative D has 6,000 acres of annual growing season burning in the short term and 10,500 acres in the long term. This alternative would have slightly higher emissions than current management levels in the short term and long term.

Alternative F has 30,000 acres of probable annual prescribed burning in the short and long terms. Alternative F has 4,000 acres of annual growing season burning in the short term and 10,000 acres in the long term. This alternative will have very similar emission levels to alternative D in relation to current management levels.

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; constructing roads; reconstructing roads; constructing wildlife openings

These activities have a minor effect on air quality by adding exhaust gases from equipment related to construction and dust particles to the air. The amount of gases released will be relatively small, of short duration and will add a small portion to the cumulative emissions in the area. Increased visitation on the Forest will result in more traffic and more exhaust gases. More campgrounds will also produce more smoke from additional campfires. This effect will be small and occur over a long period of time. The probable amount of recreational facilities, trails, roads and wildlife openings constructed by alternative is shown in Tables III-1a, b and c.

Maintaining developed recreational facilities; maintaining trails; maintaining roads; maintaining wildlife openings

These activities will add exhaust gases to the air from maintenance equipment and will vary by the level of maintenance, miles of roads and trails, number and capacity of recreational facilities and acres of wildlife openings. This effect will be small and short in duration and add a small amount to the cumulative emissions in the area. The estimated amount of recreational facilities, trails, roads and wildlife openings by alternative is shown in Tables III-1a, b and c.

Closing roads

Road closure should reduce the amount of vehicle traffic on the Forest and the subsequent exhaust emissions and dust. This effect varies by the estimated miles of roads closed as displayed in Tables III-1a, b and c.

Charging user fees

There will be little, if any, effect on air quality.

Cross-country motorized vehicle travel

This activity will add exhaust gases to the air. The amount will be small, of short duration and will vary slightly by the degree of use allowed in the alternatives. A comparison of OHV use by alternative is found in Tables III-1a, b and c.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine; managing hardwood in pine stands, managing transitions and inclusions

These activities affect air quality in relation to the methods used. These effects are discussed under harvesting trees, establishing regeneration, prescribed burning, applying herbicides and timber stand improvement.

Harvesting trees

Equipment used to harvest and transport trees will produce exhaust emissions. Harvest will temporarily reduce the photosynthesis rate in the harvested area and reduce the storing of atmospheric carbon. A portion of the trees will be used for lumber and be considered a long-term storage of carbon. A portion of the trees will be used for fiber production or as fuel and a portion of this will be converted to atmospheric carbon dioxide. These effects are short term and vary by alternative by the amount of trees harvested. Tables III-1a, b and c show the estimated acres of harvest by alternative. Table II-14 shows the periodic allowable sale quantity by alternative.

Establishing regeneration

There will be some emissions from equipment used in the establishment of regeneration, but this effect will be small and of short duration. Site preparation may be done by prescribed burning. The effects of burning on air are

discussed under prescribed burning. As trees become established, the net primary production of the area will increase and atmospheric carbon will be stored. Tables III-1a, b and c show the estimated acres of regeneration by alternative.

Applying herbicides

This activity will produce a small amount of emissions from equipment used for this purpose. Areas treated with herbicide will initially have less carbon storage due to defoliation, but will recover as different species begin to grow back. The overall effect on air quality will be very small. A comparison of herbicide application by alternative is found in Tables III-1a, b and c.

Prescribed burning

This activity emits a substantial amount of gases and particulate matter and affects air quality more than any other activity. The effects of prescribed burning on air quality are discussed in the R-8 FEISVM pages IV 106-113 and by Komarek (1983). These effects apply to prescribed burning done on the Forest and vary by the acres burned annually and the season of burn. Growing-season burns tend to emit more smoke than similar dormant-season burns. Tables III-1a, b and c show the estimated acres and season of prescribed burn by alternative.

Timber stand improvement

The effects on air quality for this activity are similar to the effects of harvesting trees and applying herbicides. The estimated acres of pre-commercial thinning and release by alternative are shown in Tables III-1a, b and c.

Soil and Water

Current Condition

Soils: Forest soils are characterized by deep sands on the ridges to plastic clays in bottoms. Soils found on upland flats usually have adequate moisture for vigorous plant growth. Soils on ridges usually have adequate moisture for vigorous plant growth only during April, May and June. Most soils are adequately fertile; however, the poorly drained soils have low fertility levels and hydrous oxides of iron and aluminum that cause some restrictions on pine tree growth. Approximately 35 percent of soils are extremely wet, have high shrink swell clays and/or high in sodium salts.

Water: The Forest is located within the South Atlantic Gulf Water Resource Region and contributes to the surface water of the Santee River, Cooper River, Wando River, Awendaw Creek, and a few small intertidal drainages. Physical features of the area (including topography, tidal currents, rainfall, soils and land use) result in a complex and often poorly defined drainage system. Reservoirs which may influence water quality and quantity of surface or groundwater include Lake Moultrie and Lake Marion with the Cooper River rediversion.

There are several groundwater aquifers under the Forest. These aquifers vary in water quality properties such as acidity, hardness and dissolved solid content. Portions of the Forest serve as aquifer recharge areas.

The Forest receives an average of 48 inches of rainfall per year and an average water yield estimated at 13 inches. Stream flow generally declines during summer months into August or September when lowest flow occurs, and increases during winter months with highest flow usually occurring during March. However, these periods of low and high stream flow can vary from year to year depending on spring and summer rainfall and extreme effects such as hurricanes and tropical storms.

Consumptive surface water use from the Forest is limited. Nonconsumptive beneficial water uses in and adjacent to the National Forest include recreation, wildlife, agriculture and aquatic ecosystems. Aquatic ecosystems provide for a variety of fish and in a few areas, shellfish habitats. Currently there are wells at 15 recreational and administrative sites and 2 known domestic springs.

Water quality data collected by the Forest Service, US Geological Survey, and the state of South Carolina indicate that surface water quality generally meets or exceeds standards set for streams, rivers and lakes for public use and wildlife management. Sedimentation potential is low from land surface use because of the flat landscape. Streams are typically slow moving with poorly defined or diffuse channels which also results in low sedimentation potential.

There are no known long-term changes following Hurricane Hugo. Short-term changes included increases in groundwater and stream flow and a change in the duration and extent of flooding in wetland areas.

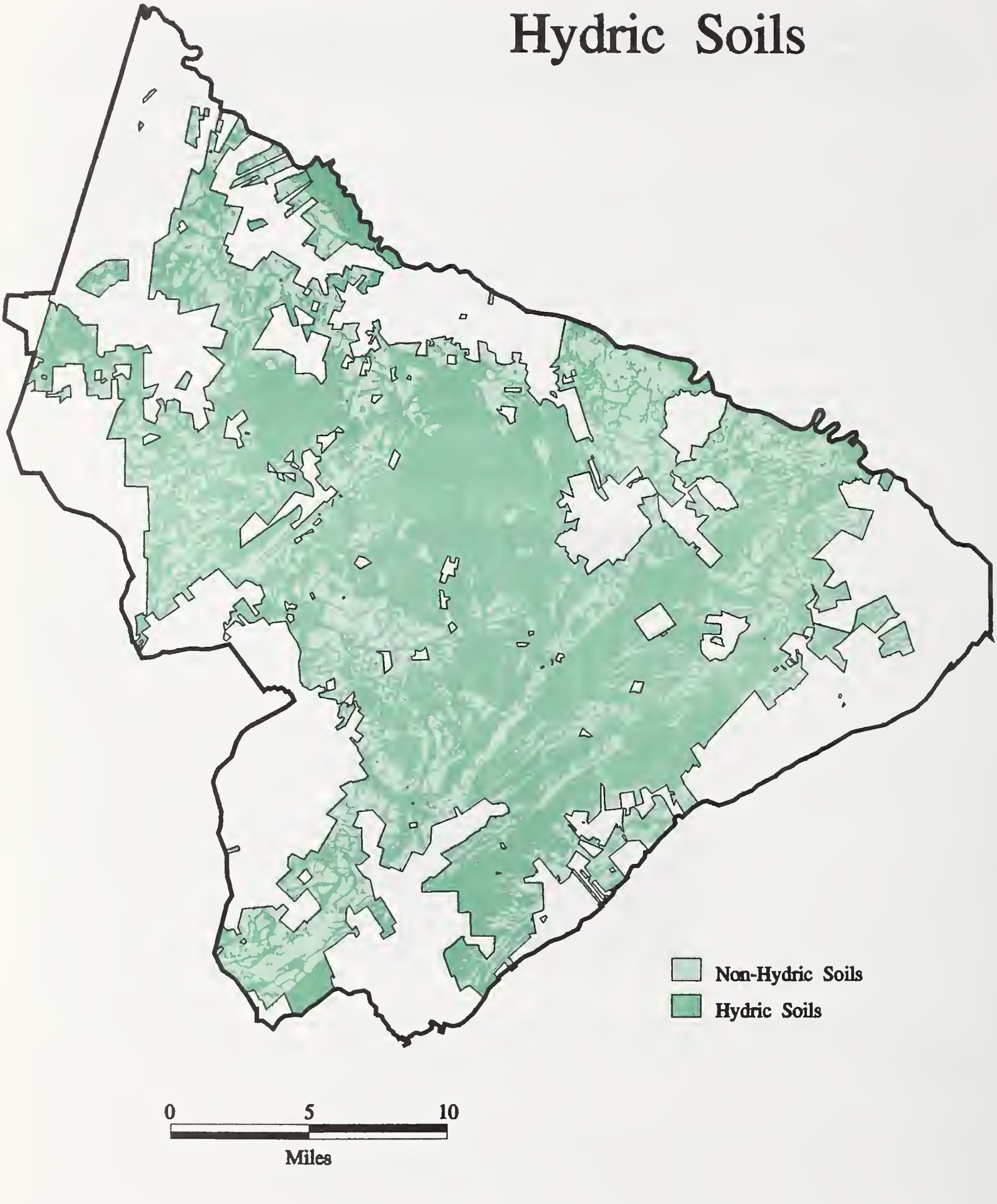
Wetlands: One of the most important aspects of delineating wetlands is an acceptable working definition. The Forest is using the definition of wetlands used by the regulatory agencies, the Environmental Protection Agency (EPA) and the Army Corps of Engineers (CE). The definition follows:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (EPA, 40 CFR 230.3 and CE, 33 CFR 328.3).

The purpose of the LMP is not to make site-specific decisions on what is or is not a wetland; such delineation will be incorporated throughout individual project planning. For Forest Plan purposes, hydric soils were selected as the basis for identifying potential wetlands. Hydric soils usually exhibit wetland hydrology and support hydrophytic vegetation. This correlation is especially strong in the coastal plain of South Carolina.

Hydric soils are defined as soils which are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper region of the soil (USDA Soil Conservation Service (SCS) 1987). Based on hydric soils that are identified in county soil maps and inventories conducted by USFS and SCS personnel, the Forest currently has approximately 143,000 acres of hydric soils (Hydric Soils Map). All hydric soils are found in two soil drainage classes: poorly drained and very poorly drained.

Hydric Soils



Environmental Consequences

Effects by Alternative

Forest activities can cause stream sedimentation, soil compaction, erosion, reduced soil productivity, degrade water quality and affect surface and ground water flow. Changes in potential sediment yield and land treated or disturbed by management activities were used to evaluate differences between activities.

In all alternatives, the predicted sediment increase from erosion is below soil tolerance loss levels. This prediction is based on the findings in a 1988 study by the SC Land Resources in a document entitled "Assessment of Nonpoint Source Pollution by Sediment in South Carolina." This assessment developed the potential sediment yield for 280 watershed or hydrologic units across South Carolina. The potential rates of sediment yield for the seven watersheds that encompass the Francis Marion National Forest are very low compared to other watersheds across South Carolina due primarily to the flat terrain. All activities proposed are within soil loss tolerance levels and maintain productivity.

All alternatives adopt South Carolina Best Management Practices (BMPs), Clean Water Act and Federal requirements for managing wetlands and floodplains. Compliance with these measures has been found to be effective in the past.

These mitigation measures are expected to protect soil productivity and minimize organic matter loss, soil erosion, compaction and displacement. It is expected cumulative effects will be minimized by the application of these measures.

The highest potential to affect soils is timber harvesting on hydric soils. The predominant effect is extensive soil compaction and rutting which can disrupt ground water flow resulting in hydrologic changes such as ponding of water.

Alternative A estimates 1,860 acres of timber harvest (regeneration and thinning) on hydric soils and 1,210 acres of timber harvests on non-hydric soils annually for the next 90 years.

Alternative B estimates 1,970 acres of timber harvest (regeneration and thinning) on hydric soils and 3,030 acres of timber harvests on non-hydric soils annually for the next 90 years.

Alternative C estimates 2,550 acres of timber harvest (regeneration and thinning) on hydric soils and 1,240 acres of timber harvests on non-hydric soils annually for the next 90 years.

Alternative D estimates 1,890 acres of timber harvest (regeneration and thinning) on hydric soils and 2,390 acres of timber harvests on non-hydric soils annually for the next 90 years.

Alternative F estimates 1,950 acres of timber harvest (regeneration and thinning) on hydric soils and 1,780 acres of timber harvests on non-hydric soils annually for the next 90 years.

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; constructing roads; reconstructing roads

Constructing roads, recreational facilities and trails can cause soil compaction, stream sedimentation and may disrupt ground water flow where heavy equipment is used on wet soils. Disrupting water flow may result in lands adjacent to these activities becoming wetter or drier. Construction activities also remove these lands from production and future on-site loss productivity is effected. Proper placement and construction design will reduce these effects. Constructing recreational facilities may effect water quality depending on location and method of waste disposal.

Sedimentation of streams may occur during construction of boat ramps and canoe access areas temporarily reducing water quality due to some exposed mineral soil. Temporary erosion may be expected into streams from construction and stream bank disturbance. Increased motorized boat traffic may increase stream bank erosion and water quality effects from potential boat or human wastes.

Tables III-1a, b and c show the estimated amount of recreational facilities, trails and roads planned for construction.

Maintaining developed recreational facilities; maintaining trails; maintaining roads

Maintaining facilities, trails and roads reduces the future risk of degrading water quality and sedimentation by ensuring the proper functioning of drainage structures. Maintenance also reduces the potential off-site damage by keeping the sites in good condition for users. Users will likely have a greater satisfaction and are more likely to stay on site. Allocation of ROS classes limits user density, thereby may have an impact on soil structure. (See ROS maps page III-113 through III-117.)

All alternatives propose maintaining existing and proposed recreational facilities, trails and roads at a constant level. The estimated number of facilities, trails and roads maintained by alternative is found in Tables III-1a, b and c.

Charging user fees

There will be little, if any, effect on soil productivity or water quality by charging user fees.

Cross-country motorized vehicle travel

Cross-country motorized travel is the use of OHVs off established Forest trails and open and closed developed public roads.

Off-highway vehicles have the potential to adversely effect soils due to compaction, rutting and occasional soil erosion. The potential risk for soil compaction and rutting is dependent on type and weight of vehicle, size of tires, type of soil, number of times the vehicle passes over the same ground, soils moisture conditions and ground cover. OHVs can temporarily increase water turbidity where use is concentrated at stream crossing and degrade water quality if petroleum products on the vehicle wash into the water.

The highest potential for adverse effects to the soil and water resource is on wet soils or near streams. OHV use on other soil types can cause compaction, rutting, soil erosion and water degradation, but the potential risk is lower than the wetter sites.

The OHV travel management comparison by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

These activities may cause a short-term increase in soil erosion until ground cover is established. Long-term effects on soils are positive if nitrogen-fixing plants are planted or the openings are fertilized. Water quality effects may occur if they are located in riparian areas adjacent to streams.

The estimated acres of wildlife openings constructed and maintained by alternative are found in Tables III-1a, b and c.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine; managing hardwood in pine stands; managing transitions and inclusions

These activities affect soil productivity depending on the type of harvest and regeneration methods used. These effects are discussed under harvesting trees, establishing regeneration, prescribed burning, applying herbicides and timber stand improvement. The probable amount of these activities by alternative is found in Tables III-1a, b and c.

Closing roads

Roads remove Forest land from timber production or other uses. Closing and obliterating roads accelerate soil recovery. If roads are closed by some type of barricade, there is little effect on increasing soil productivity and some erosion may occur if unsurfaced roads are not maintained or revegetated. Closing roads in riparian areas along streams can improve water quality or riparian habitats.

The probable miles of closed roads by alternative are found in Tables III-1a, b and c.

Harvesting trees

Timber harvesting activities including construction of temporary roads, log skidding and decking may cause soil compaction and rutting which can alter surface hydrology and ground water movement. The potential to change soil physical properties depends on the type, weight of machinery used, size of tires, type of soil (clay versus sand content), number of passes of machinery over the same ground, moisture content of soil, and vegetative material or debris on the site during harvest. Harvesting activities may also create temporary increases in erosion and displace nutrients. The highest potential for adverse effect to the soil and water resources is on hydric soils. Removing trees will temporarily increase water yield until the vegetation grows back. Increases in water yield will be minimal due to flat terrain, the degree and duration of saturation may increase site moisture conditions. Uneven-aged harvest methods may result in increased soil compaction on wet areas due to the increased frequency of entries.

The potential risk of thinning harvests compared to regeneration harvests is slightly less since in thinning harvests the trees are generally smaller and can be logged with smaller equipment. However, both types of harvests cover approximately the same percentage of acres within a logged–over area.

Tables III-1a, b and c show the estimated acres of harvest by alternative.

Establishing regeneration; applying herbicides; timber stand improvement

The primary effects on soil productivity and water quality from establishing regeneration occur during site preparation activities. In general, the mechanical methods have a greater potential for negative effects than other methods. The risk of compaction depends on the same variables as for harvesting trees. Additional risks from nutrient displacement, erosion, sedimentation, soil heating, and nutrient leaching depend on the type of site preparation and the amount of area exposed. Nutrient displacement, soil compaction and impacts to surface such as ground water movement may result when areas are bedded, piled, disced, or windrowed.

Site preparation may be accomplished by using manual or mechanical means that chop or physically remove vegetation or disturb the soil, applying herbicides to individual plants or certain areas on the site, applying fertilizers, or burning an area. Applying any or a combination of these methods is a site-specific decision. The R-8 FEISVM, pages IV 86-98 and Appendix C1–C24 disclose the potential effects on soil productivity, water quality and mitigating measures for these methods.

Herbicide use compared by alternative is found in Tables III-1a, b and c. The probable acres of regeneration for each alternative are summarized in Tables III-1a, b and c. Fertilization is used to establish loblolly pine on certain hydric soils. These areas are typically deficient in available phosphorus. Site productivity is increased in terms of pine stocking and future growth with addition of phosphorus (Law, 1985). The estimated acres of fertilization are found in Tables III-1a, b and c.

Pre-commercial thinning and release treatments pose minimal risk to soil productivity and water quality since relatively small areas are exposed. Most treatments are done by hand. Even when heavy equipment is used, there is sufficient ground cover on the site to buffer against erosion and compaction. The R-8 FEISVM discloses the potential effects on soil productivity, water quality and mitigating measures for the methods used in these activities. The estimated amount of timber stand improvement by alternative is shown in Tables III-1a, b and c.

Prescribed burning

Effects of this activity include increased nitrogen availability, phosphorus cycling, soil heating, erosion, sedimentation and nutrient leaching. Temporary increase in soil moisture and/or water table may also occur following hot burns. The magnitude of the effects depends on the soil type, weather, fuel condition on the site, the season in which the burn is conducted, and how often the area is burned (annually, biannually, etc.). The R-8 FEISVM, pages IV 80-86, IV 99-100 and Appendix B disclose the potential effects on soil productivity, water quality and mitigating measures for the use of prescribed fire.

An activity associated with prescribed burning is establishing control lines. Natural barriers such as streams and wet areas may be used, but plowed lines may also be constructed. Constructing plowed lines has the potential to cause short–term erosion, nutrient displacement, sedimentation and alter drainage patterns. If done according to mitigation measures, these negative effects are of short duration and insignificant. Wildfires can cause a reduction in soil productivity and nutrient cycling. Historical records for fire occurrence indicate the annual acreage burned during the past 10 years is less than 600 acres with each fire burning less than 10 acres. Based on past trends, the potential risk for reduction in soil productivity is considered low.

The estimated amount and season of burning are shown in Tables III-1a, b and c

Fire

Current Condition

This element of the environment is discussed in relation to the risk of wildfire and the potential damage to Forest resources.

The Forest averages 86 wildfires each year which burn approximately 575 acres. Most wildfires are caused by people. Most fire result from arson followed by debris burning, lightning, escaped campfires, children playing with fire, smoking and equipment.

The intensity of wildfires in the coastal plain depends on two major factors: weather and fuels. Weather influences the condition of fuels and the rate of fire spread. The type, amount, arrangement and size of the fuels affect their availability to burn.

Mid-October to mid-May historically has greater fire occurrence, higher spread rates, more intense burns and greater potential for damage. The Forest may expect during this fire "season" to have high fire danger for 80 to 100 days, very high danger for approximately 5 days, and extreme danger for 2 to 5 days. Historically, the latter part of March and the first week of April are periods of highest fire occurrence and danger.

Live fuels range from the light herbaceous understories of typical longleaf pine stands to the extremely dense and flammable shrub bogs and bays. The type, arrangement and amount of dead fuels vary across the Forest. Extensive areas contain large amounts of windthrown trees, snags and woody shrubs which greatly complicates wildfire control actions. Fuel composition is changing from larger-sized fuel, tree stems and snags, to smaller fuels, woody shrubs and herbaceous material. For a discussion of expected changes in vegetation, see the Vegetation section in this chapter.

The arrangement (or continuity) of fuels, both horizontally and vertically, plays a key role in assessing the risk of fires spreading or spotting to adjacent areas. Over 40,000 acres of damaged trees have been salvaged since Hugo. Over 50,000 acres have been prescribed burned from 1990 to 1992. These treatments along with others such as road clearing, fire lane construction, and site preparation have broken much of the large contiguous blocks of fuel that resulted from Hurricane Hugo. However, there still exists relatively large areas of continuous fuel, primarily in the hardwood areas of the Forest. Within the damaged area, there are many snags that significantly increase the potential of spotting in the event of a wildfire. In the areas that sustained the least damage, fuels are mostly pine straw and herbaceous species.

Environmental Consequences

Effects by Alternative

Considering the desired future condition and probable management activities of the alternatives, an estimated relative ranking of the potential change in the risk of resource damaging wildfire from current is displayed in Figure III-1. This ranking is based on the long-term projected prescribed burning levels and amount of longleaf pine, and periodic levels of regeneration harvests. Since red-cockaded woodpecker management is the principle guiding factor in all three of these components, there is relatively little difference between the alternatives in risk to resource damaging wildfires with the exception of alternative A. The slight differences between the other alternatives reflect management to achieve specific alternative objectives.

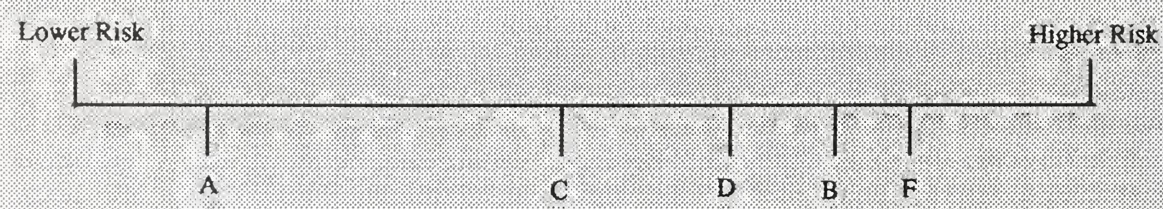


Figure III-1. Relative ranking of the potential change in risk of resource damaging wildfire by alternative.

The relative risk of resource damaging wildfires for the next 10 to 20 years does not vary between alternative due to the current vegetative conditions on the Forest. (See Vegetation section, page III-24, for the current vegetative description.)

Generally, the greater the annual prescribed burning level, the lower the relative risk of wildfire causing damage due to reduced fuel loading. Although growing season burns have a greater risk of escape, the long-term condition of the fuels should reduce this risk.

The greater the forest-wide amount of longleaf pine, the lower the relative risk of wildfire-causing damage due to longleaf's greater tolerance to wildfire.

Also, the greater the amount of long-term periodic regeneration, the greater the risk of wildfire-causing damage due to young stands having a lower tolerance of fire. By inference, the lower the periodic regeneration, the forest would have relatively more older stands which are less susceptible to wildfire damage.

It should also be noted that although the risk of a wildfire-causing damage to resources may vary in the long term among alternatives, the estimated occurrence and extent of damaging wildfire is influenced primarily by the fire protection and suppression program of the forest. This program is developed for the selected alternative considering estimated fuel conditions, historic weather and fire ignition data, values assigned to specific resources and Plan direction. The implementation of a specific fire program is dependent principally on budgetary constraints.

Alternative A is estimated to have the lowest risk of resource damaging wildfire of any of the alternatives. This alternative proposes to have the highest long-term level of prescribed burning (60,000 acres), the most longleaf pine (63,600 acres), and the lowest periodic regeneration (11,000 acres).

Alternative C is estimated to have the next lowest risk of resource damaging wildfires. This alternative proposes to have the second highest long-term level of prescribed burning (42,000 acres), the fourth highest level of longleaf pine (46,500 acres) and relatively the same level of regeneration as Alternatives D and F (13,200 acres).

Alternative D is estimated to have the third lowest risk of resource damaging wildfires. However, the risk is only slightly above the risk in alternative C and slightly lower than alternative B. This alternative is estimated to have the fourth highest long-term level of prescribed burning (35,000 acres), the third highest level of longleaf pine (52,400 acres), and relatively the same level of regeneration as alternatives D and F (13,000 acres).

Alternative B ranks slightly higher than D and slightly lower than F in risk of resource damaging wildfires. This alternative is estimated to have the third highest long-term level of prescribed burning (40,000 acres), the lowest level of longleaf pine (37,000 acres), and the highest periodic regeneration (17,400 acres).

Alternative F is estimated to have a slightly higher risk of resource damaging wildfires than alternative B. This alternative is estimated to have the lowest long-term level of prescribed burning (30,000 acres), the second highest level of longleaf pine (53,500 acres), and relatively the same level of regeneration as alternatives C and D (13,200 acres).

Effects of Probable Activities

Constructing developed recreational facilities; maintaining developed recreational facilities

These activities temporarily rearrange the fuels which may burn during a wildfire. Generally, these activities reduce the risk of damage to the site. Additional recreational areas will require protection and more control lines. Allocation of ROS classes will increase potential risk of wildfire as user density increases. (See ROS maps on pages III-91 through III-94.)

The estimated number of recreational facilities to be constructed and total maintained by alternative is shown in Tables III-1a, b and c.

Constructing trails; maintaining trails

Trail construction rearranges fuels. Trails create fire barriers which limit the spread of wildfire and serve as control lines for wildfire control. Trails also provide access to the Forest; therefore, risk of fire occurrence in these areas will increase. Motorized vehicle trails may pose a higher risk of fire from vehicles. The estimated miles of trails constructed and total miles of trail by alternative are shown in Tables III-1a, b and c.

Charging user fees

Charging user fees will have little effect on risk of wildfire. There may be a slight increase in the risk of arson due to negative public reaction to fees for access or services.

Cross-country motorized vehicle travel

Cross-country motorized vehicle travel may cause minor changes in the fuels across the Forest. Areas open to this type of travel will have greater risk of wildfires because more people are using the Forest and the risk of vehicle-related fires and arson may increase. The OHV travel management comparison by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

Constructing or maintaining wildlife openings changes the fuels within the area from a forested to an open field condition. Generally fire spread rates are greater in fields, but intensity levels are lower. The affect depends on the season. Fields can be breaks when green. Due to the small average size of openings, the effects will be minimal. Tables III-1a, b and c show the estimated acres of wildlife openings constructed and maintained by alternative.

Closing roads; constructing roads; reconstructing roads; maintaining roads

The road system on the Forest plays a key role in response time for control equipment and personnel and serves as barriers to fire spread. Construction activities cause changes in fuel arrangement while maintenance activities reduce fuel loads adjacent to roads.

When roads are closed, access for control is reduced. Access to users is reduced which may result in less risk of arson in the area. Risk of arson in other areas may increase due to negative public reaction of closing access. Tables III-1a, b and c show the estimated miles of road closure, construction, reconstruction and estimated miles of open roads by alternative.

Converting pine stands to mixed stands

This activity will shift the fuel type from relatively small needle and herbaceous material to a more woody shrub fuel type. Intensity of wildfires will increase while spread rates will generally decrease. Chance of ignition may decrease as fuels shift from pine straw to woody fuel. Fires in mixed stands will result in more damage to the timber resource.

The conversions are limited to wetter areas in Alternative F. These areas are normally subject to wildfires during droughts which occur regularly. Fire spread may be lessened due to the change in the type of fuels associated with mixed stands. Tables III-1a, b and c display the probable amount of conversions planned in Alternative F.

Converting loblolly pine to longleaf pine

This activity results in a minor change in fuel types. Since the conversions are limited to the drier areas within the Forest, this shift will be relatively minor due to the historical burning practices. The converted areas will be subject to more frequent fires, but risk of damage should be reduced due to longleaf pine's greater tolerance to fire and the reduction of fuels. The estimated acres of loblolly converted to longleaf are shown in Tables III-1a, b and c.

Harvesting trees

Harvesting trees temporarily rearranges the existing fuels, increases the amount of slash and creates drier conditions in ground fuels by allowing more sunlight to reach the ground. Depending on the utilization of cut material, the intensity, difficulty of control, and spread rates of wildfires will generally increase immediately following harvesting operations. As the logging slash decays and deteriorates, these effects diminish in a few years. Salvage harvests will reduce difficulty of fire control by removing large fuels and snags from the area. In large areas with contiguous blocks of trees, harvesting trees breaks up the continuity of fuels, reducing fire spread rate and intensity. The estimated acres of harvest by alternative are found in Tables III-1a, b and c.

Establishing regeneration; applying herbicides

The various methods of site preparation, including the use of herbicides, may increase or decrease the risk of damaging wildfires. Dead vegetation will increase wildfire risk in the short term. Large fuels may be removed or reduced resulting in less difficulty of fire control. In areas recently regenerated, herbaceous species temporarily dominate the site resulting in increased rates of fire spread but lower intensities.

Young trees are more susceptible to fire damage than older, larger trees. Even-aged, young plantations have a high risk of damage from a wildfire. The risk of fire damage in these stands decreases as they age. In uneven-aged stands, the risk of fire damage to young trees is constant since young trees remain within the stand in perpetuity. The uneven-aged system may be more resilient to damage by wildfire due to the various age classes on the sites. Longleaf pine regeneration has less risk of fire damage than loblolly pine. The estimated acres of regeneration by alternative are shown in Tables III-1a, b and c.

Timber stand improvement

Timber stand improvement activities such as release or pre-commercial thinning normally increase the risk of destructive wildfires to the remaining vegetation by temporarily increasing fuel loads. This risk is reduced as the growth rates on the remaining trees are increased and larger trees are produced in a shorter time. The estimated acres of timber stand improvement by alternative are found in Tables III-1a, b and c.

Prescribed burning

Prescribed burning has the greatest effect on the risk of destructive wildfires in the Forest than any other activity. Fuel loads are reduced thus lowering the intensity of wildfires resulting in easier fire control and less resource damage (Komarek 1983).

Prescribed fires also decrease the risk of wildfires burning onto adjacent lands. Although management requirements reduce the likelihood, prescribed fires can "escape" and become a wildfire. Tables III-1a, b and c show the estimated amount and season of prescribed burning by alternative.

Managing hardwood in pine stands; managing transitions and inclusions

As the amount of hardwoods increases in pine stands, the risk of wildfire occurrence in these stands will decrease. Small hardwoods are generally more subject to damage from wildfires; therefore, these areas will have a greater risk of damage from wildfires. More transition areas and inclusions found across the Forest result in more variation in fuels types and the less risk of wildfire. Protecting transitions and inclusions from fire will add cost to burning.


NEHR

Biological Environment

Vegetation

Current Condition

Plant Communities: Several unique plant communities have been identified and described on the Forest. Hurricane Hugo had little impact on these plant communities (Porcher, 1982 and 1990). Botanist have found 32 species of orchids, 22 species of ferns and four genera of carnivorous plants with over 12 species (Porcher 1981, Porcher, 1983 Personal Communication). Over 30 of the 67 natural communities in South Carolina identified by Nelson (1986) are found on the Forest.

Currently there is no detailed Forest-wide inventory of plant communities. Dr. Richard Porcher completed three inventories of unique natural areas in 1982, 1990 and 1993. The Nature Conservancy and the USDA Forest Service are developing a Southeastern Regional Ecological Community Classification System. For a listing of the probable communities found on the Forest, see Appendix F. When this system is approved, an inventory of the Forest's communities will be conducted. In addition to the Ecological Community Classification System, a potential natural vegetation classification is also planned. In the absence of these two classifications, plant communities are presented using dominant forest cover types and age-class distributions of each type to represent successional stages reflecting differing plant communities.

Forest Cover Types: Tree species are inventoried as forest stands and classified as being a certain forest cover type. A forest stand is defined as a group of trees occupying a specific area. A stand is uniform in species composition, age arrangement, and condition so as to be distinguishable from other adjoining areas.

Forest cover type is a classification which identifies the tree species whose crowns dominate a forest stand. Forest cover types with single tree names do not represent pure stands of that tree species. Up to 30 percent of a stand may contain other tree species while retaining the single tree species name. Stands which have several tree species and no single species dominate 70 percent or more of the stand are classified as mixed cover types.

The cover types on the Forest can be grouped into seven general types. Table III-2 lists the acreage and percentage of the forest by these types. The Forest Types Map displays the general location of these types. A

Table III- 2. Acreage by tree species group and percentage of total Forest acres.

Tree Species Group	Acreage	% of Forest Acres
Loblolly Pine*	114,917	46
Longleaf Pine	36,980	15
Pond Pine	6,698	3
Mixed Hardwood and Pine◊	9,818	4
Upland Hardwood Species	1,643	1
Bottomland Hardwood	18,974	7
Swamp Hardwood•	44,737	18
Non-forested LandΔ	15,736	6
Total	249,503	100

*Includes a small acreage of shortleaf and slash pine.

◊Includes hardwood and pine types in relatively equal proportions.

• Includes baldcypress.

ΔIncludes non-forest and brush species.

discussion of each type follows.

1. Loblolly pine is the dominant tree species on the Forest. Loblolly grows in a wide variety of landforms and drainages. Common species associated with stands of loblolly are dogwood, holly, sweetgum, maple, oaks, wax myrtle, gallberry, greenbrier, blackberry, pepperbush, switch cane and many other grasses, sedges and herbaceous plants.

2. Longleaf pine grows on drier, sandy ridges but as with loblolly, can be found in many places. Longleaf pine is commonly mixed with loblolly pine. Other species associated with longleaf stands include turkey oak, blackjack oak, bracken fern, cinnamon fern and a wide range of herbaceous species.

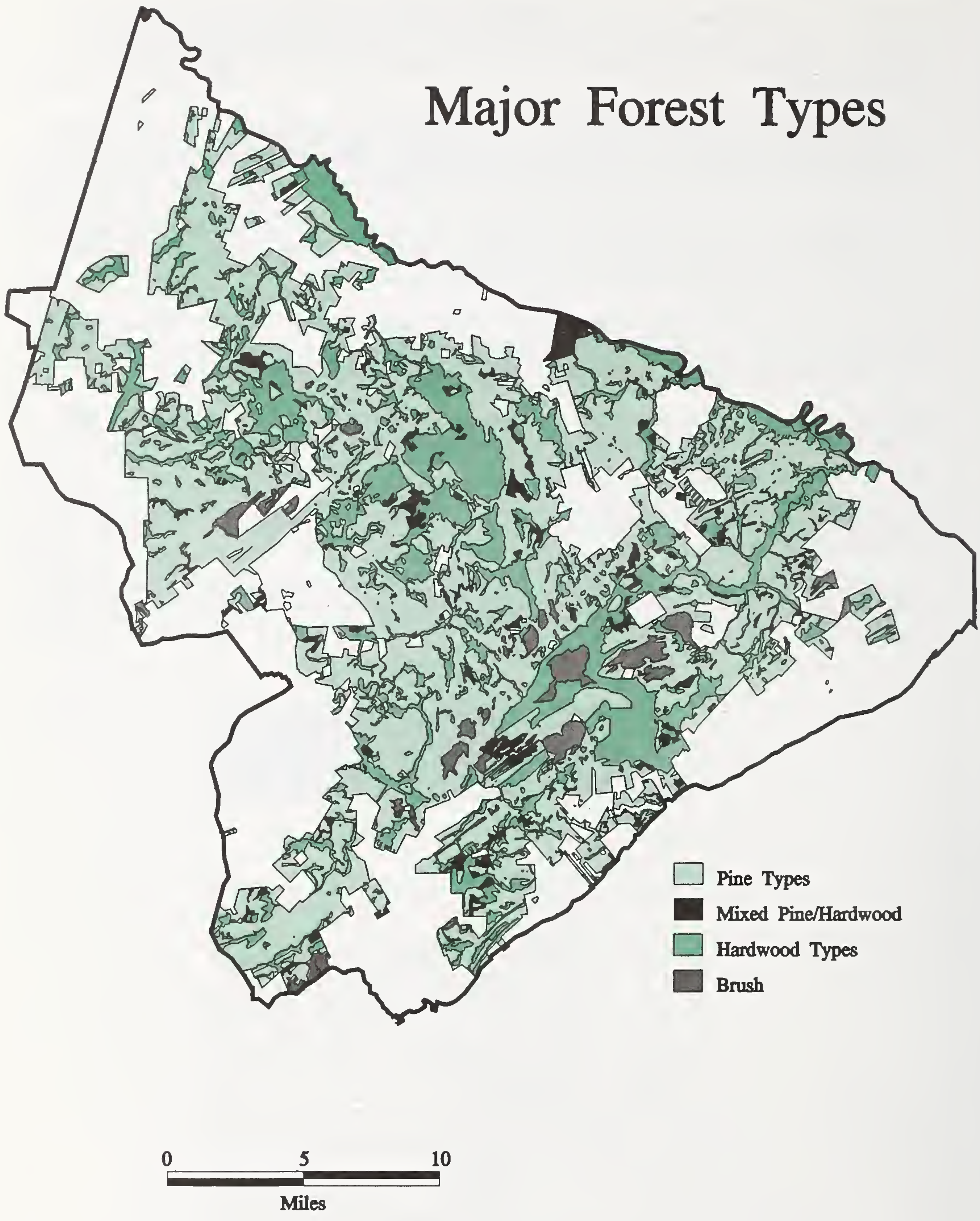
3. A small portion of the Forest is dominated by pond pine. Pond pine is found mostly on wet or poorly drained sites in depressions called bays in association with a heavy understory of shrubby vegetation. Tree species associated with pond pine are sweetgum, red maple and loblolly-bay.

4. Mixed pine/hardwood stands grow predominantly on the wetter soils throughout the Forest. Species within this type include loblolly pine, sweetgum, southern red oak, white oak, and red maple. A small component of the mixed stands occur on the drier sites and typically include longleaf or loblolly pine and red oaks.

5. Bottomland hardwoods grow primarily in the floodplains along creeks and streams. Bottomland hardwood stands usually have a mixture of cherrybark oak, swamp chestnut oak, sweetgum, red maple, water oak, willow oak, blackgum, yellow-poplar, and laurel oak.

6. Swamp hardwoods grow in the creek and muck swamps. The swamp hardwood species are usually baldcypress and water tupelo.

7. Upland hardwood stands which are on the drier sites are a relatively minor component of the Forest. These stands are primarily mixtures of southern red oak, turkey oak, blackjack oak and a small component of loblolly or longleaf pine.


Major Forest Types
Pine Types
Mixed Pine/Hardwood
Hardwood Types
Brush
0
5
10
Miles

Many stands have more loblolly pine than before Hugo. This shift resulted primarily from an abundant loblolly seed crop at the time of the hurricane and the favorable conditions created by the storm for seed germination and growth. Areas which have experienced the greatest increase in loblolly composition include wetter sites associated with bottomland hardwoods, and upland sites where loblolly outgrows hardwood sprouts and seedlings. There are areas where the dominant species was loblolly before Hugo and are now predominantly hardwood species.

Age-class Distribution: Hurricane Hugo removed the canopy of over 50,000 acres of the pine stands on the Forest. This essentially shifted the age-class distribution to the 0-10 year age-class for the pine stands. (See Figure III-2.)

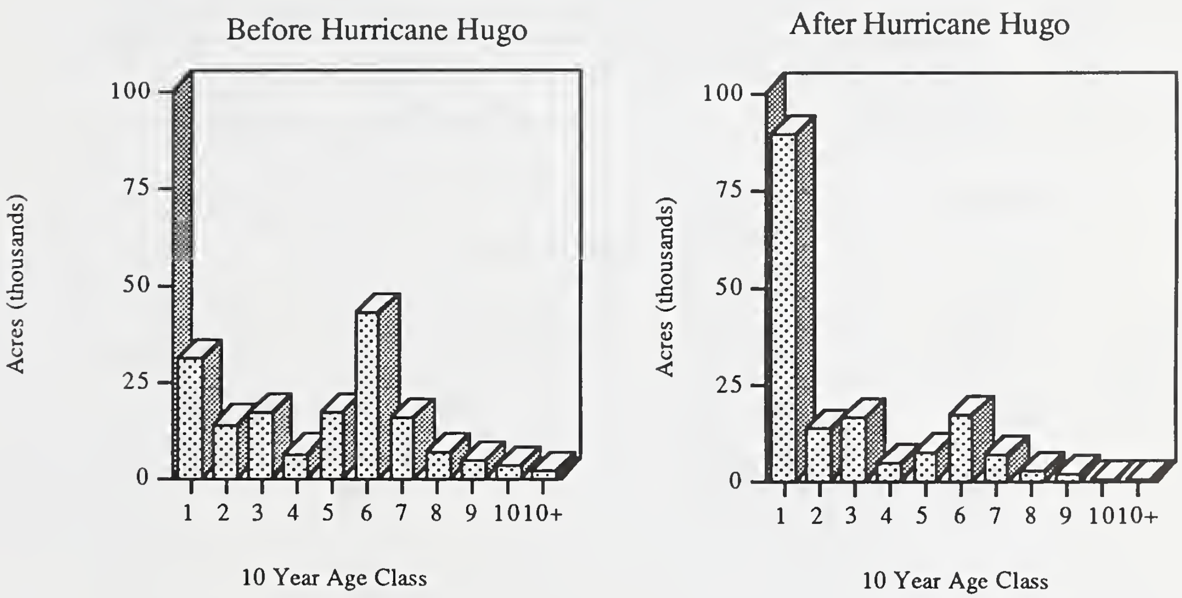


Figure III- 2. Age class distribution of pine types before and after Hurricane Hugo.

Figure III-3 depicts the age-class distribution of the hardwood types. Overall, hardwood stands retained a large proportion of their canopies. Although some individual stands, primarily large crowned, shallow-rooted species such as oaks, were destroyed, no general reductions or shifts in age-class distribution can be made as with the pine types.

Years	Age Class	Years	Age Class
0-10	1	51-60	6
11-20	2	61-70	7
21-30	3	71-80	8
31-40	4	81-90	9
41-50	5	91-100	10
etc. (An age class spans 10 years.)			

Figure III-3. Current Age class distribution of hardwood and mixed types.

Effects by Alternative

The cumulative effects on vegetation by implementing the alternatives are estimated by displaying the probable long-term forest-wide dominant forest cover type composition (Figure II-7) and the probable age class distributions of these types (Figures III-4, 5 and 6). The dominant forest cover types are a broad vegetative classification which is made up of many plant communities. Age class distributions of each of these types are provided to reflect the various successional stages of communities within these types. The prescribed burning regime will have a significant effect on the type of plant communities found on the Forest as well as the timber management schedule of thinning and regeneration. Both the burning regime and the timber harvest schedule is tied very closely to the requirements for the red-cockaded woodpecker in all alternatives.

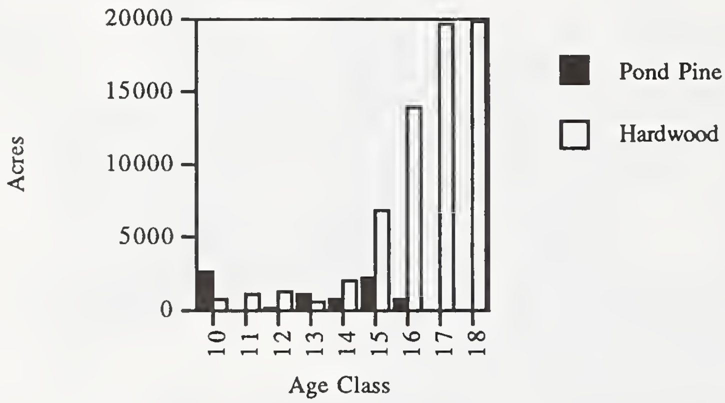


Figure III-4. Long–term age class distribution for pond pine and hardwood for all alternatives. (Age class 10 = 101-110 years, etc.)

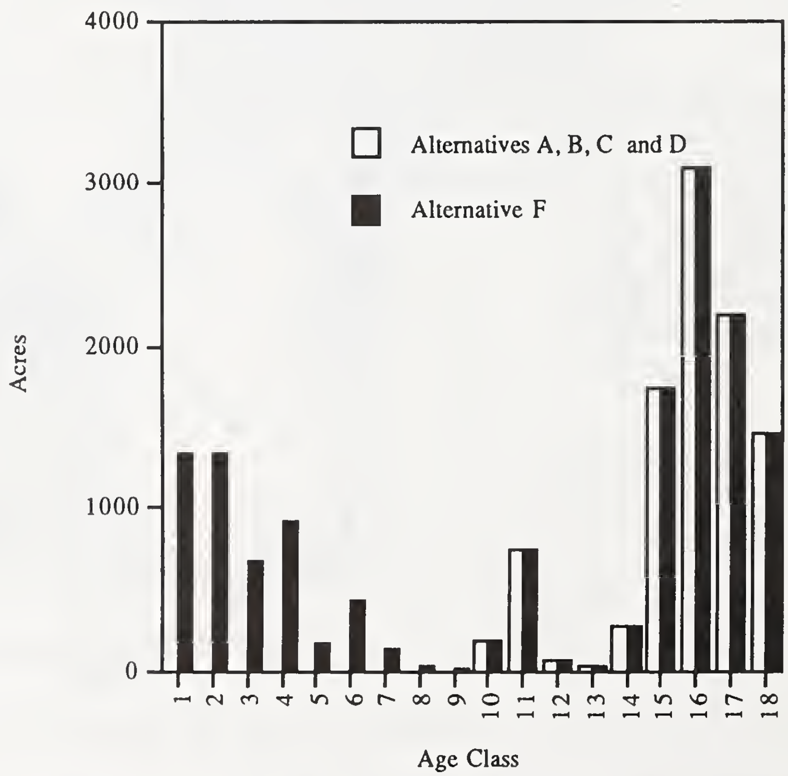
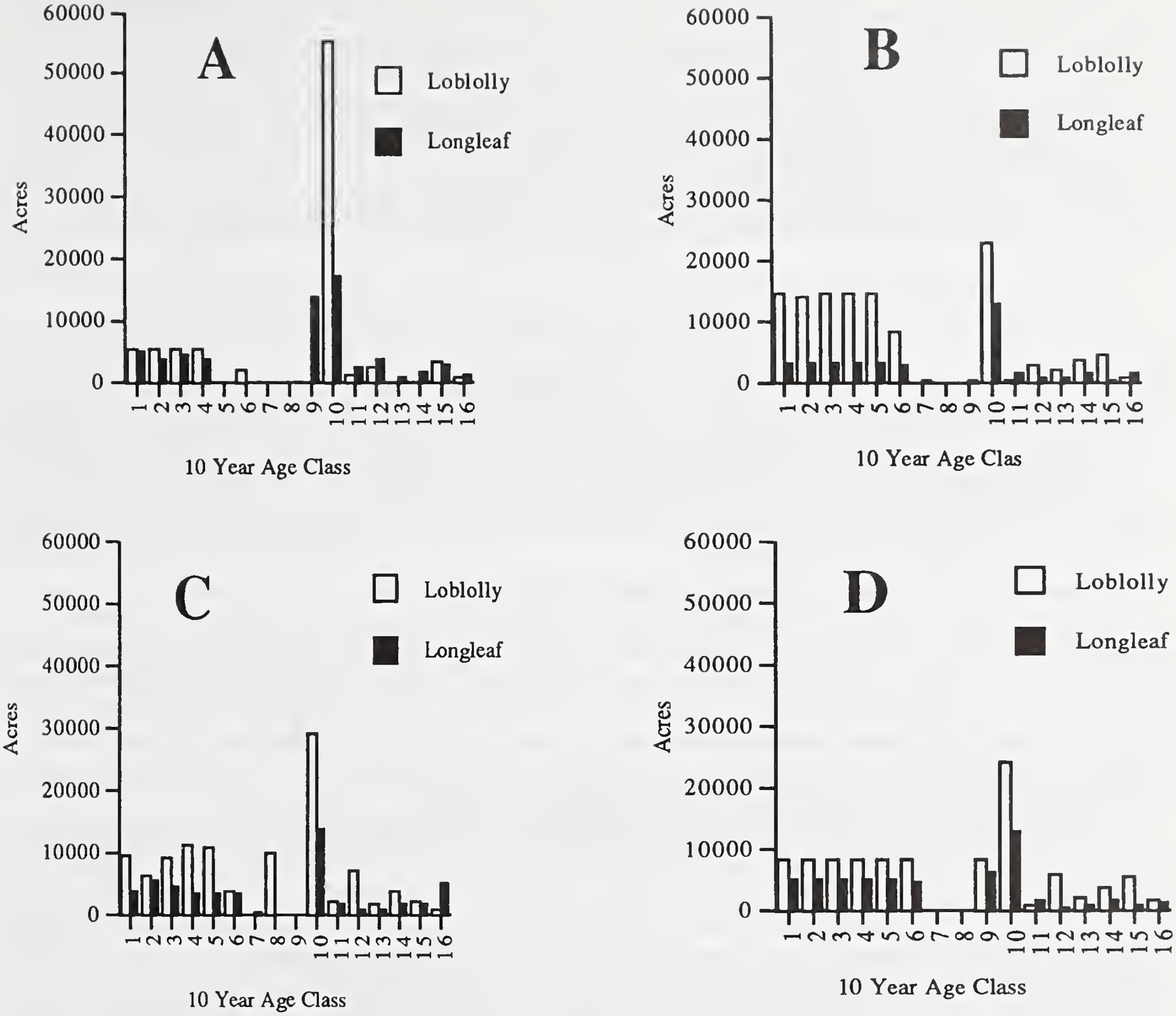
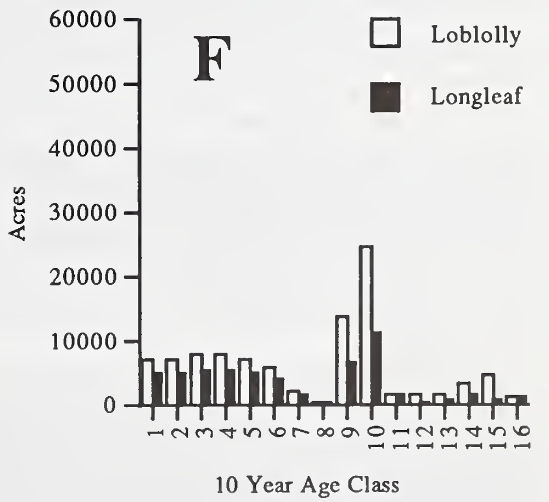


Figure III-5. Long–term age class distribution for mixed types in all alternatives.





Years	Age Class	Years	Age Class
0-10	1	51-60	6
11-20	2	61-70	7
21-30	3	71-80	8
31-40	4	81-90	9
41-50	5	91-100	10
etc. (An age class spans 10 years.)			

Figure III-6. Long-term age-class distribution, loblolly and longleaf, by alternative.

All alternatives have a probable schedule of thinning approximately 44,000 acres of pine stands in the first 10-year period. A similar level of thinning continues in all alternatives until the ninth 10-year period when differences between alternative thinning regimes begin to show. In the first period, pine stands which have been thinned will have wider-spaced and larger trees compared to unthinned stands. Understory vegetation in the thinned stands will grow more rapidly than in unthinned stands due to the increase in sunlight through the open canopy. Hardwood midstory will be reduced within the HMA in all alternatives. However, hardwood stands, inclusions and transition areas in the HMAs are managed differently by alternative.

In all alternatives, the proportion of swamp hardwood, upland hardwood and pone pine is not expected to change. The major difference in forest types will occur in the loblolly, longleaf, bottomland hardwood and mixed forest types.

Alternative A will have the major forest types represented in the following probable proportions in the long term: loblolly pine, 35 percent; longleaf pine, 26 percent; mixed pine/hardwood types, 4 percent; bottomland hardwoods, 8 percent. (See Figure II-7.) The better-drained loblolly and longleaf forest types will be dominated by fire-dependent communities due to the high level of prescribed burning, especially growing season burning. Approximately 64 percent of the pine acres, and 100 percent of the mixed and hardwood acres will be over 90 years old in the long term. (See Figures III-4, III-5 and III-6.) With the aggressive growing season burning in this alternative, the hardwood component in pine stands will decrease over time. Another result of the burning program is an expansion of fire-related plant communities in the pine and pine-hardwood types. The entire Forest is in the red-cockaded woodpecker HMA in this alternative and the burning program will be applied in most of the pine and pine-hardwood stands, approximately 160,000 acres.

Alternative B will have the major forest types represented in the following probable proportions in the long term: loblolly pine, 46 percent; longleaf pine, 15 percent; mixed pine/hardwood types, 4 percent; bottomland hardwoods, 8 percent. (See Figure II-7.) Approximately 2/3 of the Forest is in the red-cockaded woodpecker HMA in this alternative, and the prescribed burning program will be applied to most of the pine and pine-hardwood stands in the HMA, approximately 120,000 acres. Acres of fire-related plant communities within the HMA will expand in the long term, and the hardwood component within the HMA may be reduced due to the burning regime. Pine stands outside the HMA will be managed more intensively and on shorter rotations which will lead to pine plantations with a minimum hardwood component except in scattered inclusions.

Alternative C will have the major forest types represented in the following probable proportions in the long term: loblolly pine, 42 percent; longleaf pine, 19 percent; mixed pine/hardwood types, 0 percent; bottomland hardwoods, 12 percent. (See Figure II-7.) Approximately 48 percent of the pine acres, and 87 percent of hardwood acres will be over 90 years old in the long term. (See Figures III-4, III-5 and III-6.) This alternative's red-cockaded woodpecker management areas consists of lands within 3/4 mile of red-cockaded woodpecker clusters and is slightly less than 2/3 of the Forest, approximately 115,000 acres. There will be some expansion of fire-related communities within areas where there are regular growing-season burns, but overall, the hardwood component in pine stands on the Forest will remain constant or increase. Mixed stands are converted to bottomland hardwoods in this alternative. Pine stands outside 3/4 mile of a RCW cluster will retain the hardwood component up to 30 percent.

Alternative D will have the major forest types represented in the following proportions in the long term: loblolly pine, 40 percent; longleaf pine, 21 percent; mixed pine/hardwood types, 4 percent; bottomland hardwoods, 8 percent. (See Figure II-7.) Approximately 42 percent of the pine acres and 100 percent of hardwood and mixed type acres will be over 90 years old in the long term. (See Figures III-4, III-5 and III-6.) The entire Forest is in the red-cockaded woodpecker HMA in this alternative and the burning program will be applied in most of the pine and pine hardwood stands, approximately 160,000 acres. The burning regime will cause an expansion of fire-related plant communities in the pine and pine-hardwood types. Mast-producing hardwoods will increase throughout the Forest in existing hardwood stands, within inclusions in pine stands and in transition areas between pine and hardwood stands.

Alternative F will have the major forest types represented in the following proportions in the long term: loblolly pine, 38 percent; longleaf pine, 21 percent; mixed pine/hardwood types, 6 percent; bottomland hardwoods, 8 percent. (See Figure II-7.) Approximately 39 percent of the pine acres, 100 percent of hardwood types and 66 percent of the mixed type acres will be over 90 years old in the long term. (See Figures III-4, III-5 and III-6.) About 2/3 of the Forest is in the red-cockaded woodpecker HMA in this alternative, and the burning program will be applied in most of the pine and pine-hardwood stands, approximately 120,0000 acres. The prescribed burning regime will result in an expansion of fire-related plant communities in the pine and pine-hardwood types mostly within the HMA. Mast-producing hardwoods will increase throughout the Forest in existing hardwood stands, within inclusions in pine stands and in transition areas between pine and hardwood stands.

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; constructing roads; reconstructing roads

These activities cause a permanent alteration to the existing vegetation on the site. Ruderal communities as described by Porcher (unpublished manuscript) will likely replace existing vegetation. Ruderal communities are disturbed areas such as lawns, roadsides, sidewalks and fields where little is left of the natural vegetation and non-native plants dominate. By concentrating various user groups to specific areas, effects to vegetation in the surrounding forest will be negligible. The probable amount of these construction activities planned by alternative is found in Tables III-1a, b and c.

Maintaining developed recreational facilities; maintaining trails; maintaining roads

These activities will perpetuate ruderal communities (lawns, landscaped areas) resulting from the construction activities. By maintaining these communities and removing unwanted vegetation, user satisfaction of these areas will be high, and the risk of users impacting other areas will be low. Allocation of ROS classes will have a direct link with intensity of allowable vegetation, management activities and will affect vegetation composition and growth. (See ROS maps on pages III-91 through III-94.) Tables III-1a, b and c show the estimated amount of facilities, trails and roads by alternative.

Charging user fees

Charging user fees will have little effect on vegetation.

Closing roads

If roads are temporarily closed by some type of barricade, there will be less maintenance and more vegetation on the roadsides. If roads are obliterated, ruderal communities will be destroyed and native communities may be restored. The estimated miles of closed road by alternative are shown in Tables III-1a, b and c.

Cross-country motorized vehicle travel

Cross-country motorized vehicle travel may kill or injure plants. Effects on plant communities will be slight assuming travel is dispersed. If travel becomes concentrated, risk of death or alterations to existing plant communities will increase due to increased likelihood of soil compaction and vehicles running over plants. The OHV management comparison by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

Construction of wildlife openings often replaces existing communities with ruderal communities. Generally, those communities associated with the drier sites will be affected. Non-native species planted in these areas have potential to compete with native vegetation. Tables III-1a, b and c show the estimated acres of wildlife openings constructed and acres maintained by alternative.

Converting pine stands to mixed stands

This activity changes communities from those associated with pine stands to those associated with mixed pine and hardwood stands. Alternative F is the only alternative which has scheduled conversions. The most probable areas for conversion will be on poorly-drained soils. Bottomland hardwood species will dominate the sites. The pine component within these stands will depend on the area's proximity to red-cockaded woodpecker clusters and the need for foraging habitat. Generally, these areas will have low levels of pine since these wet sites are not typically red-cockaded woodpecker habitat. Tables III-1a, b and c show the estimated acres of pine converted to mixed stands.

Converting loblolly pine to longleaf pine

This activity changes communities that are associated with frequent winter burns to communities that depend on frequent winter and growing season burns. Scheduled conversions are limited to relatively dry sites where fire naturally occurred more frequently, usually during the growing season. The estimated amount of loblolly converted to longleaf is shown in Tables III-1a, b and c.

Harvesting trees

Harvesting trees changes age-class distribution and creates openings in the forest canopy which favor establishing certain plant communities. These communities are influenced by opening size, residual canopy, soil factors, and ground disturbance. Opening size and residual canopy are controlled by the method of harvesting. Even-aged regeneration methods such as clearcut, seed tree, shelterwood, and two– aged regeneration methods favor plant communities which are relatively intolerant to shade and competition. Selection cutting and uneven-aged management favor more shade tolerant communities. Uneven-aged methods may be applied to intolerant pine species by creating adequate opening sizes. The estimated level of harvest by alternative is shown in Tables III-1a, b and c.

Establishing regeneration; applying herbicides; timber stand improvement

These activities favor a desired species over others by eliminating or reducing competition or enhancing growth. The effect on the vegetation is dependent on the activity and the methods used. Effects on the desired vegetation are generally increased survival, growth, and dominance within the stand. General effects of manual, mechanical, and herbicide treatments are discussed below. The R-8 FEISVM, pages IV 30-52 provides a more detailed discussion of probable effects.

Manual methods may kill or injure selected vegetation by severing or girdling woody stems. Hardwoods usually resprout, but since pines do not, they are usually killed. Injury may occur to non-target vegetation by the felled vegetation. Herbaceous vegetation growth is enhanced, but, due to crown expansion of desired tree species and resprouting of hardwoods, rapid crown closure occurs making this condition temporary.

Mechanical methods may kill or injure most vegetation by severing or crushing vegetation. Mechanical methods generally reduce woody species and temporarily increase herbaceous species. Usually, the greater the disturbance of the treatment, the greater the shift in species composition. Recovery to pre-treatment woody vegetation levels varies with intensity of treatment but generally takes 3 to 10 years.

Herbicide treatments can injure or kill selected vegetation. The types and amounts injured or killed depends on many interacting factors including: initial vegetation on site, selectivity of the herbicide, application method used, pattern applied, biochemical effects, and timing of treatment.

The estimated amount of timber stand improvement treatments by alternative is found in Tables III-1a, b and c.

Prescribed burning; managing hardwood in pine stands; managing transitions and inclusions

Hardwoods within pine stands, transitions and inclusions are managed primarily by excluding or allowing prescribed fire. Prescribed burning can injure, kill, or enhance vegetation depending upon plant characteristics, fire type and behavior, topography, wind speed, temperature, length of exposure, and season. Generally pine species are less susceptible to fire damage while small hardwoods have the highest susceptibility to injury or death. Many plants (woody and herbaceous) depend on fire for seed bed preparation, germination and growth and shade reduction of the midstory so these plants can live (Komarek 1983). More discussion on the effects of prescribed burning on vegetation can be found in the R-8 FEISVM, pages IV 30-41.

Results of a long-term study on the Forest, summarized by Waldrop and others (1987), determined that season and frequency combine to produce significant differences in understory species composition and size class development. Annual growing season burns eliminated almost all shrubs and had the greatest number of herbaceous species. Annual dormant-season burns resulted in numerous low-growing shrubs, and had the next highest number of herbaceous species. Biennial growing season burns were similar to annual growing season burns in that most shrubs were reduced, but herbaceous species were the third highest in number. Periodic growing season burns created site conditions dominated by low-growing shrubs, and had an intermediate number of herbaceous species. Periodic dormant-season burns also left sites dominated by low growing shrubs and had the second lowest number of herbaceous species.

Periodic dormant and growing season burns produced two size classes of understory hardwood species, less than 2 inches and greater than 6 inches. An intermediate size class did not develop. Annual dormant and biennial growing season burns both produced understory woody species less than 3 feet tall. Annual growing season burns produced the greatest reduction in woody understory vegetation.

In general, if most stands are not burned at least every 4 years, the risk of escape and thus mortality may become too great to burn them.

The estimated amount and timing of prescribed burning by alternative are found in Tables III-1a, b and c. The alternative comparison for managing hardwoods, inclusions and transition areas is found in Tables III-1a, b and c.

Old Growth

Current Condition

Old-growth forests are ecosystems distinguished by old trees and related structural attributes. The age at which old growth develops and the specific structural attributes that characterize old growth will vary widely according to forest type, climate, site conditions and disturbance regime. Generally, old growth is typically distinguished from younger growth by several of the following structural attributes:

1. Large trees for that species and site.
2. Wide variation in tree sizes and spacing.
3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
4. Decadence in the form of broken or deformed tops or bole and root decay.
5. Multiple canopy levels.
6. Canopy gaps and understory patchiness.

This definition and description of old growth serves as a framework for the development or modification of specific old-growth definitions by forest types. Although old-growth ecosystems may be distinguished functionally as well as structurally, structural attributes are emphasized since they are readily measured in inventory work. Specific forest type old-growth definitions are currently being developed by Forest Service and other scientists.

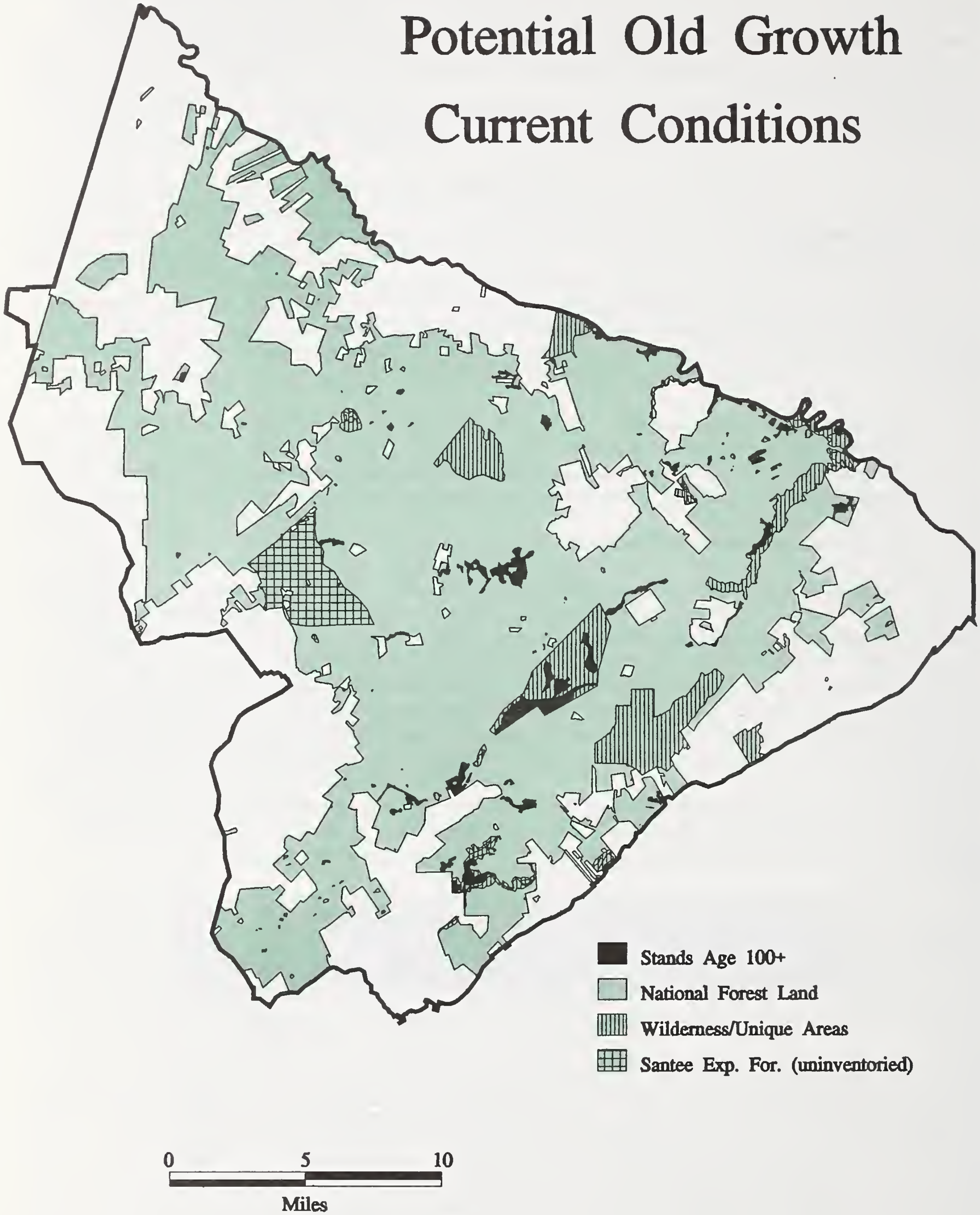
Until these definitions are completed, the Regional Forester has directed that forested stands which are greater than 100 years old or stands withdrawn from timber production be tentatively identified as potential old growth. Although not all old-age stands (100 years plus) will develop all old-growth characteristics, this designation represents the best estimator of existing and potential old-growth conditions on the Forest in the absence of specific forest type definitions.

Table III-3 displays the current estimate of potential old growth by forest type. Approximately 30,000 acres are classified as unsuitable and approximately 12,000 acres of suitable lands are greater than 100 years old. Therefore, approximately 42,000 acres or 17 percent of the forested lands are considered potential old growth.

Table III-3. Current estimate of potential old growth on suitable lands (>100 years) and unsuitable lands.

Forest Type	Suitable Lands > 100 years	Unsuitable Lands	Current Potential Old Growth
Loblolly Pine	0	3,201	3,201
Longleaf Pine	527	3,141	3,668
Pond Pine	0	276	276
Mixed Hardwood and Pine	101	1,761	1,862
Upland Hardwood	53	56	109
Bottomland Hardwood	897	1,816	2,713
Swamp Hardwood	2,933	12,334	15,267
Brush	7,353	7,286	7,286
Total	**11,864**	**29,871**	**41,735**

Potential Old Growth Current Conditions



The distribution of old growth is also an important consideration for certain wildlife relationships. The Old–growth Map shows the location of the current potential old growth.

Environmental Consequences

Effects by Alternative

Each alternative has land designated as either suitable for timber production or unsuitable (not appropriate) for timber production. The unsuitable lands will develop into stands predominantly over 100 years old while many areas that are designated as suitable will also exceed 100 years of age.

Table III-4 displays the estimated potential old growth for suitable and unsuitable lands by alternative after the 9th planning period. Wilderness (Management Area 2), brush types, Guilliard Lake Research Natural Area, unique areas in Management Area 8, and red-cockaded woodpecker clusters or replacement recruitment stands are considered as potential old growth in all alternatives and are included in the unsuitable acre estimate. These areas total approximately 30,000 acres which represent approximately 12 percent of the forested lands on the Forest. The additional acres in the unsuitable class result from allocations to achieve alternative objectives.

Table III-4.	Estimate of potential old growth by alternative on suitable lands (>100 years) and unsuitable lands after the 9th planning period.				
	Alternative				
	A	B	C	D	F
Forest Type	**Suitable**				
Loblolly Pine	0	32,483	42,013	33,105	25,623
Longleaf Pine	0	15,402	20,991	12,832	13,221
Pond Pine	0	6,420	6,420	5,766	6,420
Mixed Hardwood and Pine	0	9,801	0	9,071	9,681
Upland Hardwoods	0	1,588	1,509	1,530	1,557
Bottomland Hardwoods	0	17,107	16,252	15,808	16,204
Swamp Hardwoods	0	32,402	30,782	30,574	29,063
Brush	0	0	0	0	0
Total Suitable	**0**	**115,203**	**117,967**	**108,686**	**101,769**
Forest Type	**Unsuitable**				
Loblolly Pine	88,209	3,201	3,201	9,538	3,842
Longleaf Pine	63,688	3,141	3,141	5,097	3,233
Pond Pine	6,698	276	276	930	276
Mixed Hardwood and Pine	9,818	1,761	1,761	2,491	1,881
Upland Hardwoods	1,643	56	494	115	88
Bottomland Hardwoods	18,975	1,816	2,605	3,115	2,719
Swamp Hardwoods	44,737	12,334	13,143	14,161	15,673
Brush	7,286	7,286	7,286	7,286	7,286
Total Suitable	**241,054**	**29,871**	**31,907**	**42,733**	**34,998**
Total Suitable & Unsuitable	**241,054**	**145,074**	**149,874**	**151,419**	**136,767**

An estimate of the acres which may be older than 100 years after the 9th period for bottomland and swamp hardwoods, and pond pine is the same for each alternative. These estimates remain relatively constant since no harvests are scheduled in these types. The small differences between alternatives within these types are primarily whether the area is classified as suitable or unsuitable. In alternative C, differences resulted in the total acreage due to conversions of mixed types to bottomland hardwoods.

The estimates for the suitable loblolly and longleaf pine which may be older than 100 years after the ninth period result from the scheduling of harvests by the FORPLAN model to achieve alternative objectives.

The effects of each alternative on the potential old growth is discussed below:

Alternative A classifies all forest lands as unsuitable for timber production. However, there are probable activities such as harvesting, site preparation, burning, etc., associated with endangered species management or community restoration and maintenance. It is assumed that these activities will be conducted in a manner which is compatible with old growth. Therefore, all forested lands, approximately 241,000 acres is considered potential old growth in alternative A.

Alternative B provides no additional areas to the 30,000 acres of unsuitable lands. Within the suitable land base, approximately 115,000 acres is estimated to be greater than 100 years old. This results in a total potential old growth area of approximately 150,000 acres or 62 percent of the forested lands.

Alternative C provides an additional 2,000 acres to the unsuitable land base for a total of 32,000 acres. Approximately 118,000 acres of the suitable lands are estimated to be greater than 100 years. This results in a total potential old growth area of approximately 150,000 acres or 63 percent of the forested lands.

Alternative F provides an additional 5,000 acres to the unsuitable land by allocation within Management Area 29 for a total of 35,000 acres of unsuitable lands. Approximately 102,000 acres are estimated to be greater than 100 years old in the suitable lands. This results in a total potential old growth area of approximately 137,000 acres or 57 percent of the forested lands.

For the location of the unsuitable portion of the potential old growth, see the Management Area Maps for each alternative in Chapter 2.

Effects of Probable Activities

Since old-growth definitions for specific forest types are unavailable, effects of activities which manipulate vegetation on old-growth are difficult to estimate. Many of the structural attributes of some forest type old-growth areas may dictate that certain vegetative manipulation activities be conducted to achieve these attributes. The location, distribution, biological needs and social expectations determine the management direction for old growth. Therefore, the effects of these activities will be analyzed on a site-specific basis relative to the specific old-growth type considered.

Proposed, Endangered, Threatened and Sensitive Plants

Current Condition

The Forest is home to several sensitive plant species and federally endangered plants. Pondberry *(Lindera melissifolium)* and American chaffseed *(Schwalbea americana)*, federally endangered species, are found on the Forest. Although populations of pondberry are doing well, populations of American chaffseed have declined since the first survey (Porcher, 1991). Another plant species of concern is Canby's dropwort *(Oxypolis canby)*, a federally endangered species. Although there are no known sites of Canby's dropwort on the Forest, it is likely to grow here because of favorable habitat. Several plants have been located in both Charleston and Berkeley counties.

At least 18 other plant species have been identified as sensitive species by the Forest Service, and most are candidate species for federal listing as threatened or endangered. Sensitive species are designated by the Regional Forester and include certain species for which population viability is a concern. Habitats of sensitive species are managed to ensure population levels which will keep these plants from becoming threatened or endangered. (For a detailed list of all proposed, endangered, threatened and sensitive species found on the Forest see Appendix D.)

Environmental Consequences

Effects by Alternative

The effects on PETS species are considered by site-specific analysis and requirements of the Endangered Species Act, and risk to PETS is minimal in all alternatives.

General effects of activities on proposed, endangered, threatened and sensitive (PETS) plant species are similar to those presented in the vegetation section. Site-specific biological evaluations (BEs) are required to ensure that effects on these PETS species are considered when any project takes place. Recovery plans and Forest Handbook chapters have been prepared for several PETS species and serve as guidelines for their protection. These guides are common in all alternatives. Also constant in the alternatives is the Forest Service's legal obligation to adhere to the Endangered Species Act (16 U.S.C. # 1531-1544).

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; constructing wildlife openings; constructing roads; reconstructing roads

These activities risk damaging unknown and potential sites for PETS plant species. New PETS plant sites may be found as a result of the required pre-decision survey and analysis, and due to the increase in traffic and exposure. Increased traffic and higher use will lead to increased risk of damage to unknown and potential sites. Injury or death of plants may be accidental or result from illegal collection. Constructing wildlife openings may increase the concentration of animals in one area. This may cause an increase of wildlife users in these areas, increasing the risk of disturbance of PETS sites by both man and animal. Increased use of an area may increase the chance of discovering new sites.

Activities on the better drained sites, those often associated with fire, have a greater chance of affecting *Schwalbea*. Activities on wetter sites have increased risk of affecting *Lindera* and *Oxypolis*. Tables III-1a, b and c show the estimated number of facilities, trails, and wildlife openings to be constructed. The larger facilities have a greater chance of affecting PETS plant species by increased traffic and greater initial ground disturbance. (See Tables III-1a, b and c and Table II-5.) More road construction and reconstruction lead to greater risk of damage to unknown and potential sites (Tables III-1a, b and c).

Charging user fees

The effects of charging user fees on PETS plant species will be insignificant.

Closing Roads

Permanent road closure could result in long-term suitable habitat for PETS plant species. Closure will decrease the traffic and accessibility of the area which will decrease the risk of disturbance of PETS sites. Less access will also decrease the chance of discovery of new sites. More closure means less maintenance; therefore, the associated effects would also be minimized. See Tables III-1a, b and c for the estimated miles of closed roads.

Cross-country motorized vehicle travel

Cross-country travel may be difficult to regulate and known or potential sites may be hard to protect. The number of restrictions will influence the number of users. Fewer restrictions on cross-country motorized travel may result in an increase in this activity, increasing the risk of site disturbance. A comparison of OHV vehicle access is found in Tables III-1a, b and c.

Maintaining developed recreational facilities; maintaining trails; maintaining roads; maintaining wildlife openings

Maintaining facilities, trails and roads will have little effect on PETS plants. The number of wildlife openings maintained and the type of vegetation planted may influence PETS plants. Exotic or introduced species which are planted in these openings may out compete the native PETS species. (See chapter II discussion under Issues 1, 2, 5 and 6.) The risk is minimal with the proper site-specific analysis.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine

These activities will alter the vegetation (See vegetative section.) which may improve or degrade habitat for PETS species. Conversion of pine to mixed stands will likely take place on some of the wetter loblolly sites. These areas are not typically associated with *Schwalbea, Lindera,* or *Oxypolis.* The conversion of loblolly to longleaf may create suitable habitat for *Schwalbea*, a species found in association with a longleaf, fire-dependent community. These activities require some ground disturbance and the risk of injury to plants is greater as the number of treated acres increases. See Tables III-1a, b and c for the estimated acreage of these treatments.

Harvesting trees

Harvesting trees increases risk of damage to unknown and potential PETS sites. The chance of discovering new sites also increases. The effects of harvest depend on the acres harvested and the method used. Thinning harvests may benefit herbaceous plant species inhabiting areas with sparse overstories and herbaceous understories such as Canby's dropwort and American chaffseed. However, plant species which prefer a dense overstory and are sensitive to sunlight may be negatively effected. The estimated amount of harvest is found in Tables III-1a, b and c The method of harvest is a site-specific determination. The higher the annual harvest, the greater risk of disturbance to PETS sites and a greater chance of discovery of new sites. The age-class distribution of forest types may enhance or degrade various PETS plant habitat. Figure III-6 shows the age-class distributions of the pine types among alternatives.

Establishing regeneration

The number of acres, method, and location of regeneration determines the magnitude of the effects on PETS plant species. The more ground disturbing the regeneration method and the greater the acreage, the greater is the risk of disturbance to unknown and potential sites. Less intensive methods generally have less risk of disturbance. Intensive site preparation methods may dramatically change the existing vegetation which may harm or in some instances help the habitat for PETS species. Generally, the greater the alteration to existing vegetation, the greater the risk of damaging currently suitable habitat. See Tables III-1a, b and c for the estimated acreage of regeneration by alternative. The effects of specific regeneration methods are addressed in the R-8 FEISVM, pages IV-76-79.

Prescribed burning

The more acres, greater frequency or greater intensity will increase the risk of damage to existing PETS plants. Frequent burning or lack of fire may help or hurt PETS species. Increased number of fire lines increases chance of damage or discovery of new sites. Burning will decrease the competition of other woody species. If fire is too intense, the vegetation can be killed or injured. Growing-season burns tend to injure more woody plants than dormant-season burns. Many PETS plants have evolved with fire and depend on fire to maintain populations. *Schwalbea* is a fire-dependent species and benefits from controlled burns. The R-8 FEISVM page IV-79 further discusses the effects of prescribed fire on PETS species. The acres of prescribed burning by season by alternative are displayed in Tables III-1a, b and c.

Applying herbicides

The risk of damaging PETS species increases as the amount of herbicide use increases. The risk also varies with the method, season of application and type of herbicide used. The use of herbicides will change the existing vegetation which may harm or benefit the PETS species. Decreasing competing vegetation and possibly eliminating undesirable exotic plant species may benefit PETS species. Tables III-1a, b and c display the relative potential use of herbicides by alternative. All herbicides are toxic to any plant when applied in sufficient amounts and are considered to pose a serious risk to all PETS plants on the Forest. The R-8 FEISVM pages 78-79 further discusses the effects of herbicides on PETS plant species.

Timber stand improvement

Tables III-1a, b and c show the estimated acres of type of timber stand improvement by alternative. These treatments will change the existing vegetation by opening the canopy and exposing the understory, stimulating some species to reproduce, and releasing certain species from competition. These activities may harm or benefit the habitat for PETS plants depending on the biology and ecology of that species. The effects of various intermediate treatments are further discussed in the R-8 FEISVM pages IV-76-79.

Managing hardwood in pine stands; managing transitions and inclusions

The effects described in intermediate treatments, prescribed fire, timber harvest, and establishing regeneration also apply in hardwood management. The effects of managing for hardwoods depend on the number of acres and method employed. See chapter II for comparison among alternatives in their emphasis of hardwood management. The primary tool used to manage hardwoods is excluding or permitting prescribed fire. Generally the more area protected from fire, the greater the hardwood component. This will benefit some PETS species and harm others. The effects on the various sensitive plant species depends on their biology and ecology. *Schwalbea*, a fire-dependent species, would not benefit from the exclusion of fire.

Wildlife

Current Condition

Populations: A conservative estimate of the number of invertebrate species on the Forest is between 4,000 and 5,000, a much greater number than that of reptiles, amphibians, birds, mammals and fish combined. The mosquito family alone includes several hundred species. Invertebrates include a variety of animals such as insects, spiders, mussels and crustaceans. Little is known about these species in relation to habitats occupied, specific habitat needs, the role or niche of each species in the ecosystem, and the effects management practices have on them. There is a need for research to study invertebrates, to identify those on the Forest and their abundance in different habitats.

Approximately 43 species of amphibians and 58 species of reptiles inhabit the Forest. This list includes approximately 24 frogs and toads, 19 species of salamanders, 36 types of snakes, 10 species of turtles, and 11 kinds of lizards.

The Forest provides habitat for approximately 249 species of birds (permanent residents/migrants/transients). Several species of neotropical migratory birds (birds that winter in Latin America but nest in North America) are included in this list. Approximately 26 species of neotropical migrants use the interior portions of the Forest and 12 species utilize the habitat associated with edges or openings and early successional habitat. The Forest offers habitat for a variety of non-game bird species. From the great blue heron found in riparian areas to the red-eyed vireo found in wooded areas, the Forest offers many opportunities for outdoor enthusiasts to view wildlife. Several species of waterfowl are found on the Forest. The wood duck, an important game species, is particularly common in wooded riparian areas. Other commonly hunted game birds include the eastern wild turkey, mourning dove, bobwhite quail, and woodcock. The eastern wild turkey is second only to the white-tailed deer in popularity as a hunted big game species. The Forest is known for its pure strain of wild turkey, and this population has been used as a source for turkey for restocking programs throughout the state.

The Forest is home to about 48 species of mammals. Of these, white-tailed deer is the most popular game animal. Small game animals commonly hunted include fox, raccoon opossum and squirrel. Ten species of furbearers inhabit the Forest. Red fox, mink, muskrat, beaver and skunk are uncommon; bobcat and otter occur at moderate levels; and gray fox, raccoon, and opossum are common. Other mammals include 9 species of mice and rats, 8 species of mole, voles and shrews and larger mammals such as the black bear. The Forest is included in the historic range of the eastern cougar, and a few unconfirmed sightings have been reported in the vicinity over the years.

About 114 species of fish are found within the boundaries of the Forest. These species are found in a variety of habitats such as streams, rivers and ponds. Most are found in association with freshwater; however, some are found in association with tidal influence such as brackish and salty marshes and inlets. Of these 114 species, about 24 are considered game species. Principal game species are largemouth bass, redfin pike, chain pickerel, catfish species, and various panfish including bluegill, redbreast, shellcracker, crappie and warmouth. The Santee River is habitat

for anadromous fish principally striped bass, American shad, blueback herring and hickory shad. These species are fairly important in the local commercial industry. There are approximately 275 miles of perennial streams on the Forest. The Forest manages 59 acres of ponds which are fertilized, limed and stocked with bass and bream.

Habitat: The openings created by the hurricane are quickly closing with brushy vegetation. Although the removal of the canopy by the hurricane initially stimulated browse, the quality and quantity has been slowly decreasing since the storm. Canopy closure results in a loss of grass and grass/shrub habitat due to shading. As the canopy continues to close in these storm damaged areas, nesting sites as well as brood habitat and year-round feeding areas for turkey will be lost rapidly. Currently, browse is relatively plentiful; however, the bulk is poor quality and of low preference to deer. The amount of food high in nutrients available in the winter and early spring has declined since pre-Hugo days.

As the heavily damaged areas approach 4 years old, the percentage in grass/shrub habitat without the influence of an overstory will be about 4 percent. An additional 10,000 acres are prescribed burned each year which maintains these areas in grass/shrub habitat for a total of approximately 8 percent. For a more detailed discussion on early successional habitat and the effects of Hugo see "Francis Marion National Forest Interim Wildlife Program Strategy."

The Forest maintains approximately 410 wildlife openings comprising over 700 acres which are planted with plant species that benefit all types of wildlife. Many of these maintained openings include seeded rights-of-ways. Most wildlife openings are maintained cooperatively by the Forest Service and SCWMRD. They range in size from 1 to 3 acres.

Other important components of wildlife habitat are age-class distribution and species composition. Before Hugo approximately 12.5 percent of the Forest was in the 0-10 age class; 19 percent of the pine type was in this age class. Now almost 40 percent of the Forest is in the 0-10 age class, and about 57 percent of the pine type is in the 0-10 age class. (See Figure III-2, Age-class Distribution of Pine Types Before and After Hurricane Hugo.)

Amount of late successional habitat is an important component of wildlife habitat. Although difficult to define, some older stands are approaching ages that exhibit some late successional habitat characteristics. Before Hugo, 6 percent of the Forest acres were in the 91+ age class, about 3 percent of the pine type was in this age class. Since Hugo, there is a little less than 4 percent in this condition, and only 1 percent of the pine is included.

Almost 65 percent of the Forest is pine species, primarily loblolly and longleaf. Before the hurricane, the pine stands averaged 25 percent hardwood. Now hardwoods comprise approximately 40 percent of these pine stands. About 26 percent of the Forest is hardwood including swamp hardwoods, bottomland hardwoods, and small amounts of upland hardwoods. Mixed species stands make up less than 5 percent of the Forest. (See Table III-2, Acreage by Tree Species Group and Percentage of Total Forest Acres.)

Hard and soft mast contribute to the available wildlife foraging found on the Forest. Mast-producing hardwoods (30+ years old) occur as pure stands or in mixtures with other species on a little less than 13 percent of the Forest. Following Hugo, many mast-producing hardwoods were damaged. Quantity and quality of hard mast have declined. Large-crowned and shallow-rooted species such as oaks were generally uprooted, and approximately 85 percent of bottomland hardwoods were damaged. Soft mast such as dogwoods, blackberries and others seem to be doing well and were not significantly influenced by hurricane damage.

Available cavity trees for most woodpecker species and other cavity dwellers are numerous. However, due to the rapid decay of dead wood in the south, cavities for secondary cavity dwellers may become scarce in the near future. Suitable cavity trees for red-cockaded woodpeckers, which require live trees for excavation, are limited.

For a more detailed description of wildlife habitat conditions as a result of Hugo see "Post Hugo Interim Strategy Meeting and Proposals," 2/2/90. Effects of Hugo on populations for management indicator species and endangered, threatened or sensitive species can be found in the *Analysis of Management Situation*.

Environmental Consequences

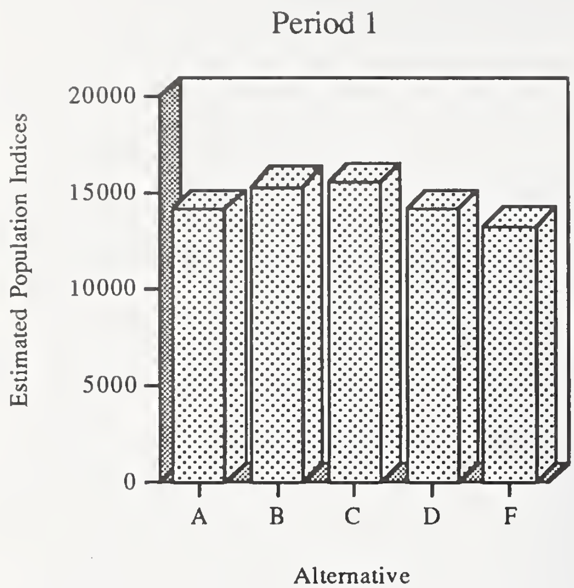
Effects by Alternative

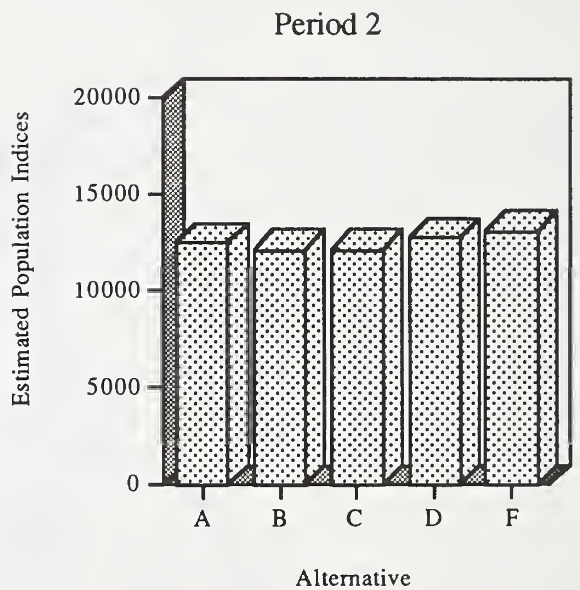
Effects of various forest resource management on wildlife can include physical injury or mortality to individual animals, and short-term and long-term habitat alteration which indirectly affects wildlife populations.

Wildlife habitat is the food, water and cover that an animal needs to survive. Each species is adapted to an unique arrangement of these elements. As habitat changes, so does the variety and abundance of wildlife species. The effect on fisheries is insignificant if best management practices and other mitigation measures are followed.

Alternatives are compared by analyzing the effects on management indicator species. A list of these species is found in Appendix B. The aquatic and riparian habitat is treated the same in all alternatives primarily through standards and guidelines. All PETS species which are being used as indicator species are also treated the same in all alternatives. Several species which represent general types of habitat, i.e., early or late successional and conifer or hardwood are quantitatively compared. The estimated population indices for several indicator species are shown in Figures III-7 to III-12. A summary of effects by alternative follows these figures.

Deer





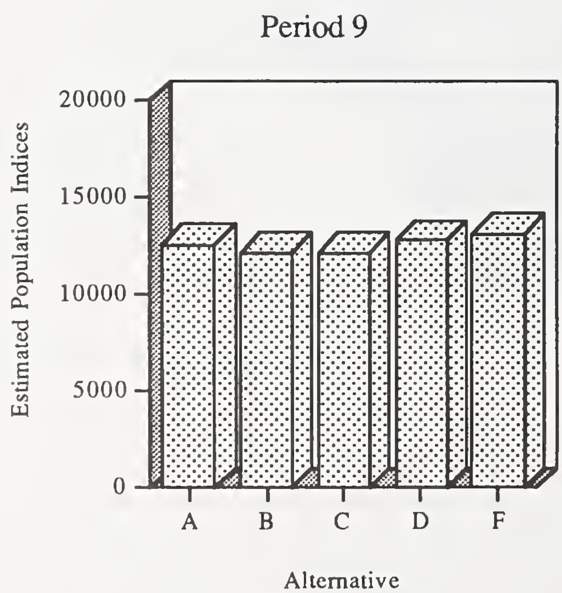


Figure III-7. Estimated population indices for deer using wildlife coefficients.

Turkey

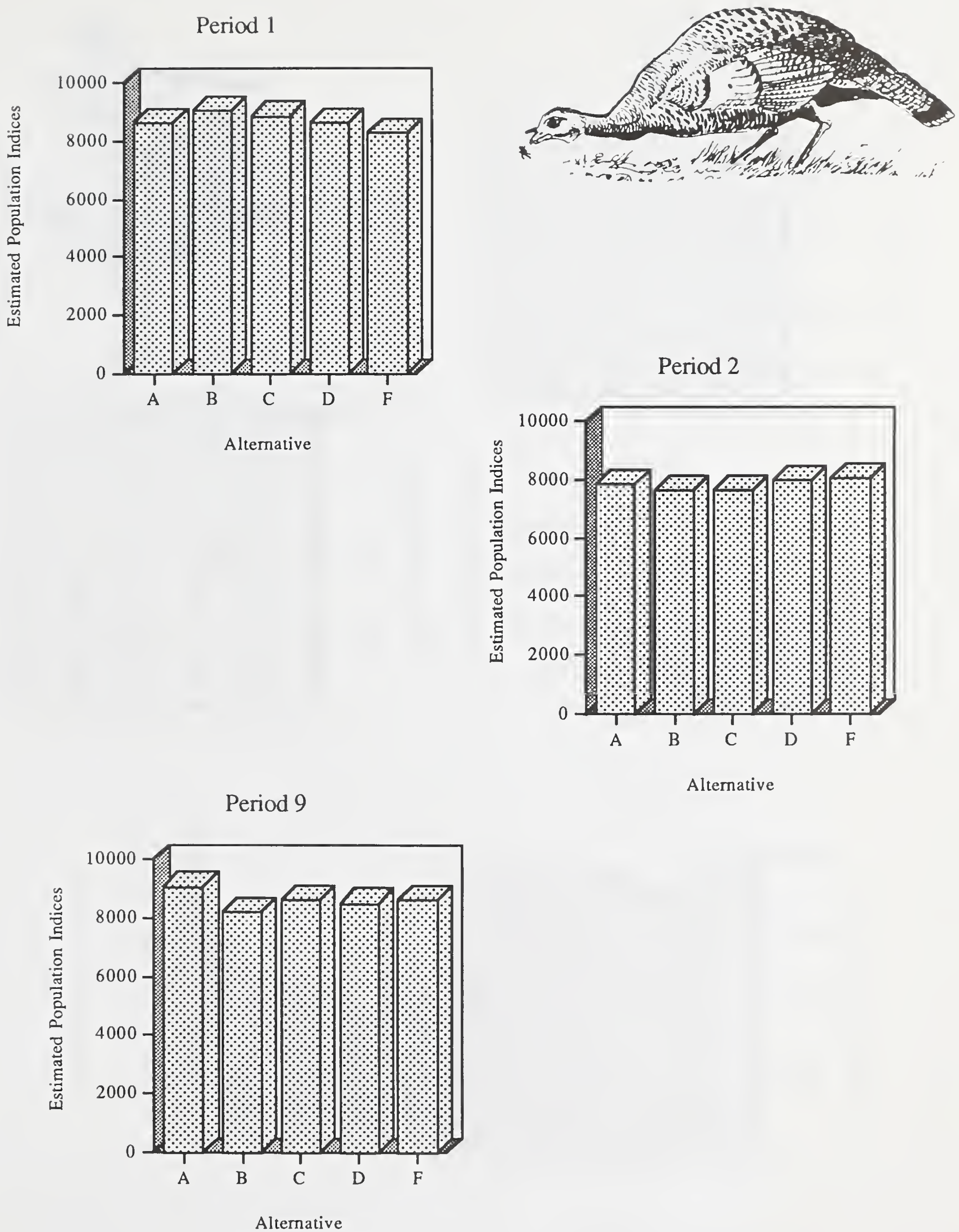


Figure III-8. Estimated population indices for turkey using wildlife coefficients.

Squirrel

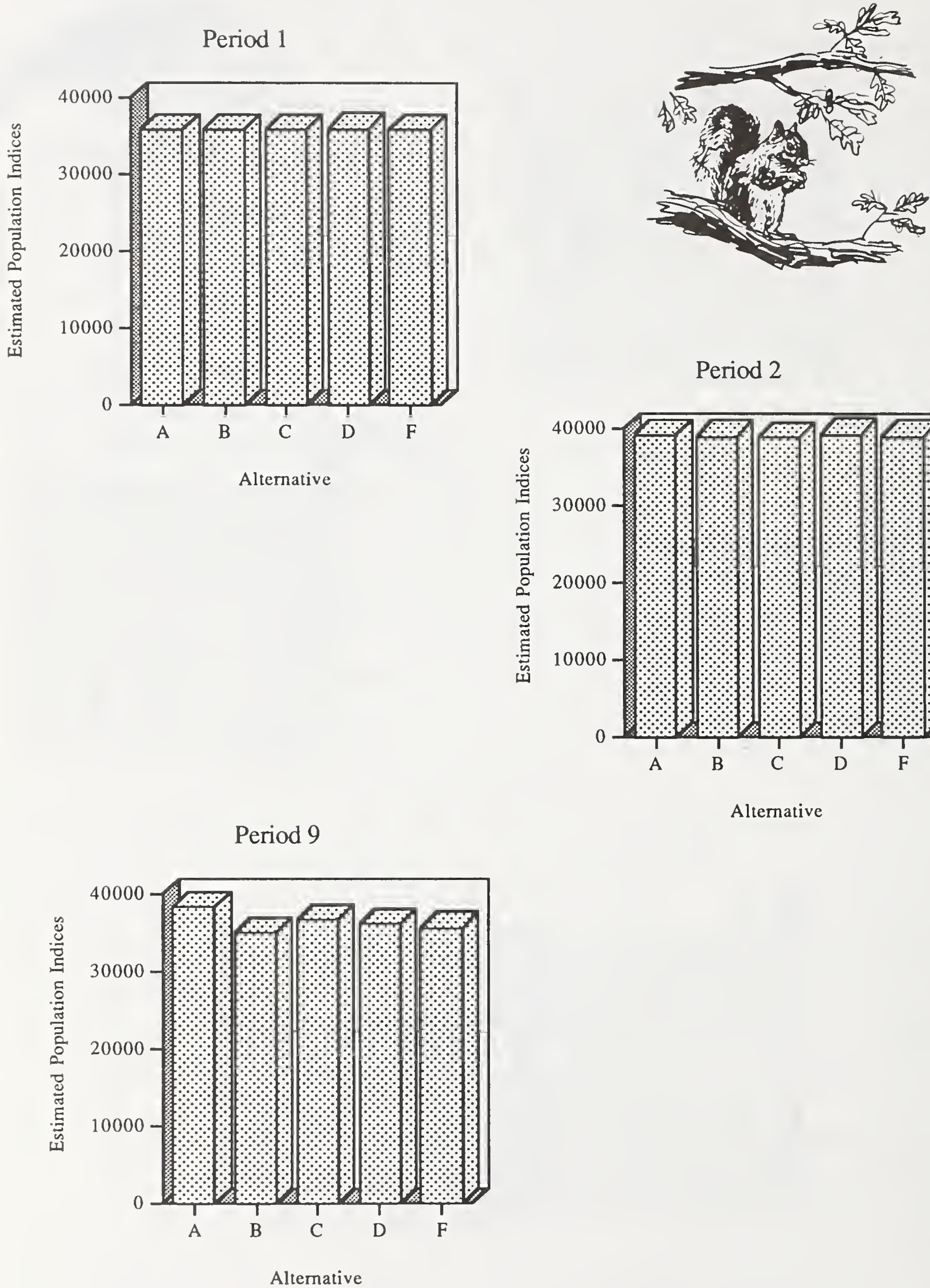
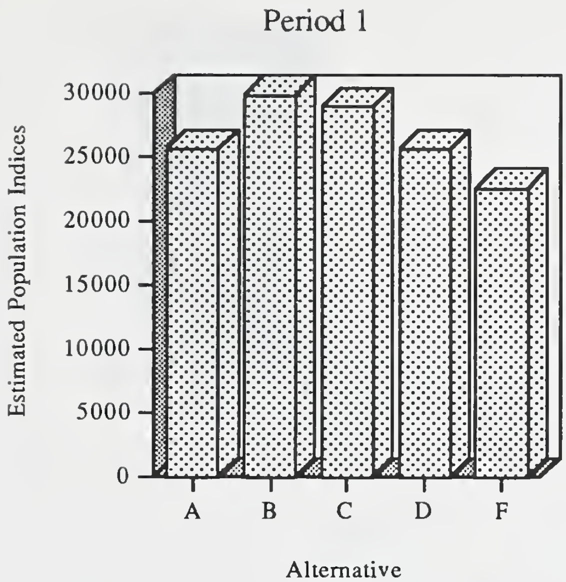
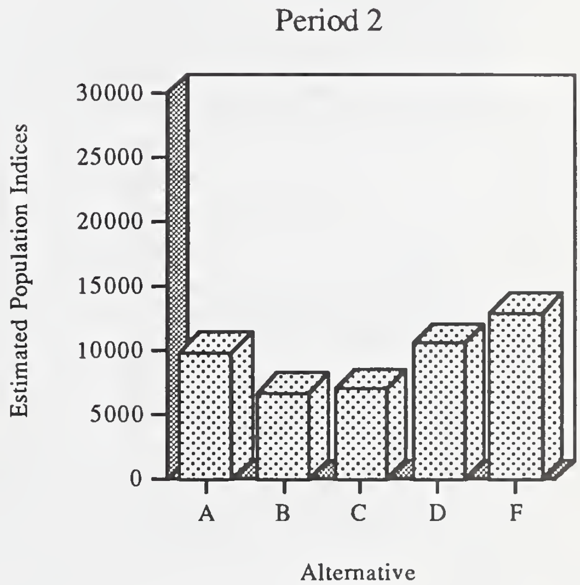


Figure III-9. Estimated population indices for squirrel using wildlife coefficients.

Quail





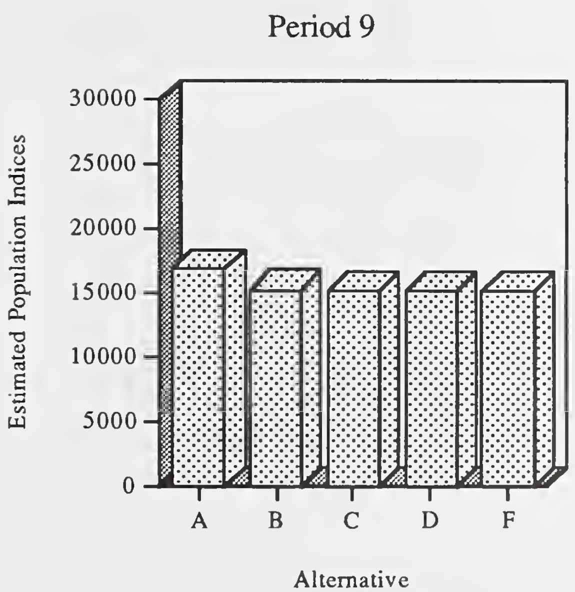
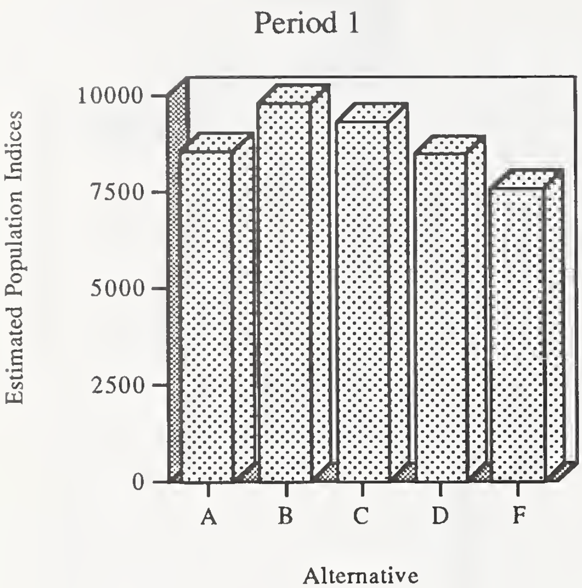
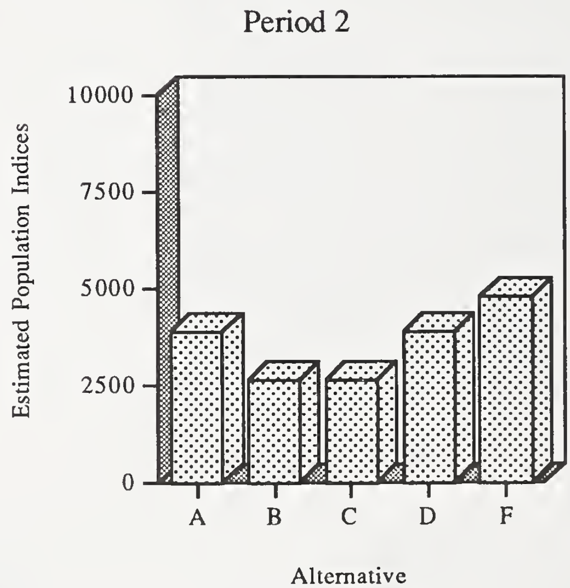


Figure III-10. Estimated population indices for quail using wildlife coefficients.

Bluebird





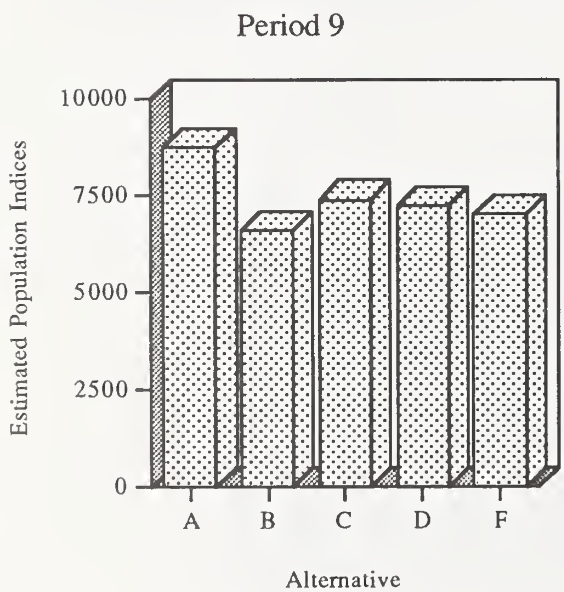
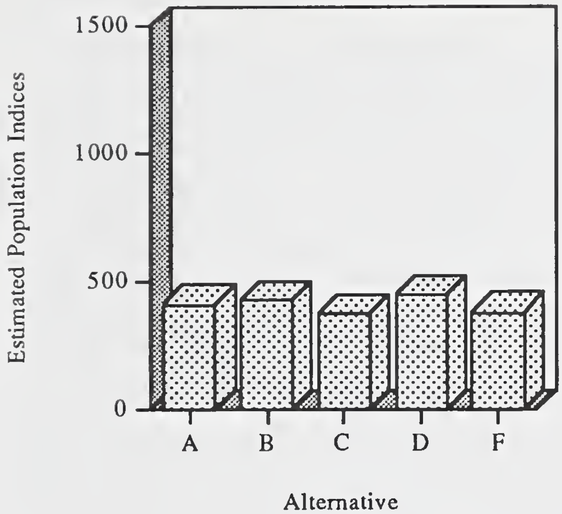


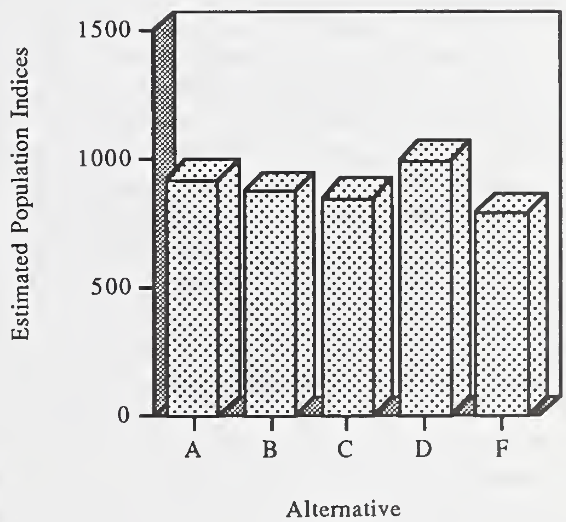
Figure III-11. Estimated population indices for bluebird using wildlife coefficients.

Red-Cockaded Woodpecker

Period 1



Period 2



Period 9

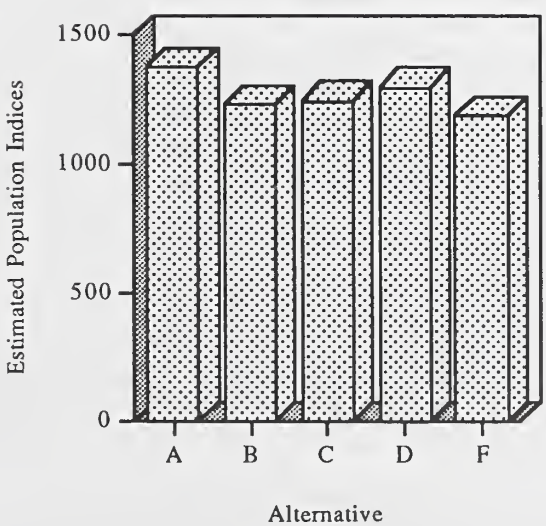


Figure III-12. Estimated population indices for red-cockaded woodpecker using wildlife coefficients.

Alternative A emphasizes maintaining natural ecosystems with lower priority given to resource product outputs. Emphasis will be on late successional species, both game and non-game, while gradually eliminating wildlife openings. Major factors that will influence populations of wildlife in this alternative are red-cockaded woodpecker management and prescribed burning. Growing season burns are emphasized on drier sites and wet inclusions every 2-3 years. The red-cockaded woodpecker HMA is forest wide. This will result in a landscape dominated by large, old, widely spaced pines with open understories. Old-growth characteristics are found over much of the forest. Hardwoods are found mostly in swamps, along streams, and other areas with natural barriers to fire.

Early successional habitat provided in this alternative in the short term is primarily a result of Hurricane Hugo. Other early successional habitats are found in utility rights-of way, wildlife openings, areas where insect outbreaks occur, and areas that are prescribed burned. Early successional species are abundant in the short-term. Species such as the white-tailed deer, bobwhite quail, yellow-breasted chat, Bachman's sparrow, white-eyed vireo and the eastern bluebird should thrive. Some late successional species are also present in viable numbers in the short term: red-cockaded woodpecker, eastern fox squirrel, pileated woodpecker, red-eyed vireo, great-crested flycatcher and the wood thrush. Loss of mast-producing hardwoods from Hurricane Hugo will result in lower numbers of wild turkey and the gray squirrel in the short term. Snags are abundant in the pine forest types in the short term, providing habitat for cavity-nesting species. As the forest begins to mature, changes to the structure and composition will occur, resulting in changes of wildlife populations. Species that utilize shrub/seedling habitats, such as the yellow-breasted chat and white-eyed vireo, will increase. Habitat will become less suitable for the bluebird, white-tailed deer, wild turkey, and bobwhite quail. As pine trees grow larger, suitable habitat for the red-cockaded woodpecker will increase. Bachman's sparrow populations will remain stable in areas that are prescribed burned. The eastern fox squirrel and great-crested flycatcher should increase as the forest begins to mature. Populations of the wood thrush and pileated woodpecker should remain stable. Red-eyed vireo and gray squirrel populations should increase as the forest begins to become structurally mature. As prescribed burning continues, snags become less prevalent until the forest matures and begins to develop characteristics of old growth. As the forest nears or reaches the desired future condition, habitat for late successional species will be abundant. Red-cockaded woodpecker, fox squirrel, wild turkey, pileated woodpecker, gray squirrel, red-eyed vireo, wood thrush, and great-crested flycatcher populations will reach their highest levels. Although late successional species are near optimum levels, early successional habitat and thus early successional species will most likely be at the lowest level in this alternative for the long term. Early successional habitat in the long term will result from wild and prescribed fire, regeneration for RCW management, natural disturbances, insect outbreaks, and maintenance of utility rights-of-way. White-tailed deer populations will be somewhat lower than the short term, but are relatively abundant. Bobwhite quail populations will also be low and most likely restricted to upland pine habitat that is frequently burned. Yellow-breasted chats are less common but are present in these areas as well as thickets and woodland margins. White-eyed vireos are also found in these areas as well as thickets and shrubby areas near moist areas and streams. Bachman's sparrow will be abundant throughout the forest in early successional habitat and in grass-forb habitat present in the understory of a mature pine forest. Conditions for bluebirds will improve slightly as the understory and midstory of the pine forest are maintained in an open condition as a result of prescribed burning.

Cumulative impacts to some species may be evident in the long term. Because the entire forest is in a RCW HMA, prescribed burning will be extensive and frequent. This may result in acorns on the forest floor being consumed and hardwoods being killed by fire. Overall, this alternative will reduce the hardwood component over time. This will lessen the carrying capacity for the fox squirrel, gray squirrel, and the wild turkey in the pine types. Wild turkeys also utilize permanent wildlife openings. Combined with the reduction of mast-producing species and loss of supplemental foraging areas in the pine uplands, turkey populations levels may be somewhat lower than optimum for hunting. In addition, birds associated with the hardwood and midstory component of pine stands may be slightly reduced in numbers due to the extent and frequency of prescribed fire reducing the foraging strata. Snags will become less numerous in the upland pine sites as a result of prescribed burning and decay. However, snags are numerous in the mixed stands and hardwoods stands as they develop characteristics of old growth forests. Forest fragmentation will be the lowest in this alternative, providing habitat for forest interior species and area sensitive species.

Alternative B emphasizes a moderate increase in developed and dispersed recreational services and production of revenue for the local economy. Wildlife emphasis will enhance habitat for game species with an increase in wildlife openings. The red-cockaded woodpecker HMA will encompass approximately 2/3 of the forest. Major factors that will influence wildlife populations are red-cockaded woodpecker management, prescribed burning, and timber management outside of the RCW HMA. Non-growing season burns are emphasized, and growing season burns are used only to prepare sites for seedling establishment and development, to maintain existing fire-dependent communities, and to increase fire-dependent native communities. The forest will be charac-

terized by a variety of age classes and sizes of trees. Loblolly pine dominates the landscape, most stands are even-aged, and timber is harvested throughout the pine types. Prescribed burning is mostly conducted in the winter months.

Early successional habitat provided in this alternative is primarily a result of Hurricane Hugo, although other early successional habitats are found in wildlife openings, utility rights-of-way, areas that are prescribed burned, and where timber harvest occurs (both in the HMA for RCW and outside the HMA). Early successional species are abundant in the short term as in alternative A. Late successional species as described in alternative A are present in the same numbers due to the condition of the forest and the activities that will be carried out in the short term. As the forest matures, effects to species will be similar to that described in alternative A, in the RCW HMA. Outside the RCW HMA, early successional habitat will be relatively abundant in the pine types. Here timber harvest will occur, creating early successional habitat. Although species such as the white-tailed deer, white-eyed vireo, and yellow-breasted chat are found within the HMA, populations of these species will be higher outside the HMA. Bobwhite quail and Bachman's sparrow are found primarily in the HMA in the longleaf pine types, where growing season burns occur, and in regeneration areas 0-3 years old. Bobwhite quail and Bachman's sparrow will be found outside the HMA in areas of timber harvest until these areas begin to mature. Late successional species outside the HMA are not favored. Prescribed burning within the HMA will result in loss of some hardwoods, but due to more emphasis on dormant season burning, mast-producing hardwood species will be present, enhancing the habitat for white-tailed deer, gray squirrel, and wild turkey. Hardwoods outside the HMA are not favored and those species that depend on hard mast and late successional forests will not be prevalent.

Cumulative effects to some species are also present in this alternative. Wildlife openings will increase. Combined with the increase of early successional habitats favored outside the HMA and the increase in wildlife openings, early successional species will be favored. The white-tailed deer, yellow-breasted chat, and white-eyed vireo will be abundant. The eastern bluebird will be abundant. Bobwhite quail populations should increase. The red-cockaded woodpecker should be at a recovered level in the HMA, and the fox squirrel should be relatively abundant since mast-producing hardwoods will be relatively numerous. Since no hardwoods are scheduled for harvest in this alternative, habitat for the gray squirrel, pileated woodpecker, red-eyed vireo, and wood thrush should reach optimum condition in the long term inside the HMA and in suitable habitat outside the HMA (swamp hardwoods, bottomland hardwoods, mixed pine/hardwood). Wild turkey should thrive as mast-producing hardwoods are present, more wildlife openings are created, and growing season burns do not disrupt the nesting period. Since early successional habitats are numerous in this alternative, the effects of forest fragmentation and forest edge must be discussed. Although many species of neotropical migratory birds require forest edge and shrub/scrub, it is possible that nest predation and brood parasitism may occur on the boundaries of the HMA where timber harvest occurs. This results in the attraction of brown-headed cowbirds, blue jays, and crows, to early successional habitat. These same effects may be highest in and near areas where timber harvest occurs adjacent to where extensive agricultural practices are carried out and where intensive forestry occurs on private lands.

Alternative C is the no action alternative which represents a continuation of the 1985 Land and Resource Management Plan as amended. Wildlife emphasis will enhance habitat for game and non-game species, and maintain existing wildlife openings. The red-cockaded woodpecker will be managed using zones of 3/4 mile radius around cluster sites. Factors that will influence wildlife populations will be RCW management, prescribed burning, and timber management. The forest is characterized by a variety of age classes and sizes of trees. The landscape is dominated by loblolly pine, and timber harvest occurs in all pine types. Prescribed burning is primarily conducted in the winter months, with a low level of growing season burns being carried out.

As in alternatives A and B, early successional habitat is abundant as a result of Hurricane Hugo. Early successional habitats are also found in utility rights-of-way, wildlife openings, where insect outbreaks occur, and areas that are prescribed burned. Populations of early and late successional species will be approximately the same as in alternatives A and B in the short term. Because of forest condition, the limited amount of regeneration harvest scheduled, and the current age class distribution, populations levels of early and late successional species will also be approximately the same in the second period for all alternatives. The major activities occurring as the forest matures will be thinning of pine stands. In this alternative, the number of existing wildlife openings are maintained, there is more of a balance of early and late successional habitats, up to 30 percent of hardwoods are maintained in pine stands, the acreage of longleaf pine increases, and mast-producing hardwoods are at the same level as alternative B. As the forest reaches the desired future condition, red-cockaded woodpeckers will reach a recovered level. The fox squirrel, gray squirrel, wild turkey, and white-tailed deer populations will be at huntable levels. Bobwhite quail populations will be higher than in the second period, but lower than the first period and will be found mostly in

frequently–burned upland pine stands. The yellow-breasted chat and white-eyed vireo are numerous, being found in the early successional habitats. Bachman's sparrows will be common in the upland pine stands. Bluebird habitat will increase in the long term as does habitat for the great-crested flycatcher. Pileated woodpecker, red-eyed vireo, and wood thrush habitat will remain unchanged and populations levels will be relatively abundant.

Cumulative impacts to neotropical migratory birds are much less than in alternative B because of the relative balance between early and late successional habitats. Impacts to neotropical migrants from nest predation and brood parasitism will most likely occur where extensive agriculture is practiced near areas of the forest that are regenerated.

Alternative D emphasizes providing a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive motorized recreational opportunities. The red-cockaded woodpecker will be managed on a forest wide HMA. Wildlife emphasis will enhance habitat for non-game species, existing wildlife openings will be maintained with emphasis on planting native species, and corridors for wildlife will be maintained and created. Prescribed burning will be conducted in the pine types throughout the HMA with about 20-30 percent in the growing season. Mast-producing hardwoods will increase and mixed pine/hardwood stands will be promoted. Most of the forest is characterized by a landscape featuring even-aged and uneven-aged pine stands of various sizes and ages. Loblolly is the dominant pine species, although 15,500 acres of loblolly are scheduled to be restored to longleaf pine.

As in all the other alternatives, early and late successional habitats are approximately the same for the short term. As the second period approaches, changes to habitat will have effects on species as described in the previous alternatives. It will not be until the forest begins to reach the desired future condition that effects will be noticeable for the species being discussed. No new wildlife openings will be created and roads will be closed in this alternative. This should alleviate some nest disturbance of wild turkey during the nesting season, leading to successful nesting, and higher populations. Mast–producing hardwoods will increase and mixed pine/hardwood stands are maintained. In addition, corridors between wilderness areas where hardwoods dominate will be established. This will tend to favor late successional species such as wild turkey, pileated woodpecker, gray squirrel, red-eyed vireo, wood thrush and great-crested flycatcher. Because the entire forest is in the HMA, a late successional pine forest will result with a recovered population of red-cockaded woodpeckers and a healthy population of fox squirrels. Early successional habitats will be present, mostly in wildlife openings, utility rights-of-way, areas of natural disturbance, where disease and insect outbreaks occur, and from harvests needed for red-cockaded woodpecker. White-tailed deer will be found throughout the forest. Bachman's sparrow and bluebirds will be found primarily in the pine stands that are frequently burned and maintained in an open condition. The yellow-breasted chat will be found in shrubby areas and thickets near the pine uplands and the white-eyed vireo will be found in thickets near streams and pine uplands, in the shrubby understory of mixed stands, and in thickets and dense areas in hardwood sites.

Cumulative effects, in the long term, will favor more late successional species. This alternative will shape a landscape with almost continuous forest canopy. This will greatly benefit neotropical migratory birds that utilize mixed stands and hardwood stands. Forest fragmentation will be reduced, providing habitat for forest interior species and area sensitive species. The understory of pine uplands and early successional habitats should support viable populations of neotropical migrants that utilize forest edge and shrub/scrub.

Alternative F emphasizes expanding the longleaf pine ecosystem, promoting mast-producing hardwoods, and mixed pine/hardwood stands and establishing areas for semi-primitive motorized recreational opportunities. Red-cockaded woodpecker management would be emphasized on approximately 2/3 of the forest. Wildlife emphasis would enhance habitat for game and non-game species, increase the number of wildlife openings, and create and maintain travel corridors for wildlife. Factors influencing wildlife populations in this alternative are RCW management, prescribed burning, timber management, increasing mast-producing hardwoods, promoting mixed pine/hardwood stands and establishing travel corridors between wilderness areas. The landscape contains predominantly even-aged pine stands of different sizes, ages and densities of trees. Loblolly is the dominant pine species, although 16,500 acres of loblolly are scheduled to be restored to longleaf pine in the long term. Mast-producing hardwoods are common and mixed pine/hardwood stands are found throughout the forest. Prescribed burning is conducted in both the dormant and growing season.

As stated earlier, the composition of late and early successional species and the effects of changing habitats in the first two periods will be approximately the same for the species being discussed in all alternatives. As the forest reaches the desired future condition, habitat for wild turkey, gray squirrel, and RCW increases. This alternative has the highest level of mast-producing hardwoods and mixed pine/hardwood stands are promoted. This will benefit the fox squirrel, wild turkey, red-eyed vireo, and great-crested flycatcher. Travel corridors in the HMA and between the wilderness areas will provide continuous canopy over much of the forest. In the hardwood sites, all late successional species being discussed will benefit. There will be some timber harvest in the HMA to manage for red-

cockaded woodpeckers. Timber management will also occur outside the HMA. This timber harvest will provide early successional habitats across the forest, while corridors in the RCW HMA and between the wilderness areas will provide a continuous forest canopy and travel corridor for wildlife. Other successional habitats will be in an increased number of wildlife openings, utility rights-of-way, where wildfire and prescribed burns occur, where there are disease and insect outbreaks, and areas of natural disturbances such as windstorms and hurricanes. The white-eyed vireo and yellow-breasted chat will be found in the variety of early successional habitats, both inside and outside of the HMA. Bachman's sparrows and bluebirds will be common in the frequently burned pine stands. Bobwhite quail will be primarily found in the longleaf pine stands and should increase as the acreage of longleaf pine increases over the long term. White-tailed deer will also be abundant both inside and outside the HMA, utilizing the increased mast in hardwood and mixed pine/hardwood stands as well as the early successional habitats.

Forest fragmentation will be reduced by having 2/3 of the Forest in the RCW HMA, by establishing corridors between the wilderness areas and by closing some roads. There will be a variety of early and late successional habitats, both inside and outside the HMA, providing habitat for a myriad of neotropical migrants. RCW management in the HMA will emphasize prescribed burning, including growing season burns. This will be favorable for bobwhite quail and Bachman's sparrow. RCW management may tend to reduce hardwoods in intensively managed areas within the HMA where frequent burning is required to maintain the open mature pine forest.

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; maintaining developed recreational facilities; maintaining trails

Any construction risks injuring individual animals and disturbing their habitat. The risk is minimal due to the necessary site-specific analysis required for every project. Construction also alters the surrounding habitat. More edge and early successional grasses and forbs are available surrounding recreational facilities. Construction risks sedimentation to nearby streams which may affect fish habitat. Constructing new facilities and trails will increase visitors and lead to more disturbance to wildlife. Motorized trail use has a greater potential to disturb wildlife. This disturbance depends on location and type of the developed site or trail. Tables III-1a, b and c display estimated number and size of new facilities. Tables III-1a, b and c show the estimated miles and types of trails proposed for construction.

Maintaining facilities will have little effect on wildlife other than those related to visitation and use. Well maintained facilities will encourage more use which may disturb some wildlife species in the vicinity of the facilities. Allocation by ROS class has a direct link with intensity of habitat management activities allowed. (See ROS maps on pages III-91 through III-94.)

Charging user fees

This activity will have little effect on wildlife.

Closing roads; constructing roads; reconstructing roads, maintaining roads

Construction and reconstruction of roads risks injury to animals and their habitat. The addition of new roads will increase the open road density on the Forest which in turn increases the level of disturbance to wildlife. Some species are more sensitive to disturbance than others. Open roads negatively affect black bear. (See discussion under PETS animals.) Open roads also pose a threat to smaller species of mammals, reptiles, and amphibians which are often injured or killed by vehicular traffic. These roads may also create fragmented habitat for certain species, such as some amphibians, which have difficulty crossing roads. A 4 year study conducted on the Forest showed that turkeys avoided nesting near roads open for vehicular traffic. Nesting hens would not tolerate human disturbance (Still and Baumann, 1990). Bidwell et al. (1985) reported that human disturbance caused most nest losses (61 percent) in his Oklahoma study. The more open roads, the more potential for poaching. Road construction and reconstruction risk increased sedimentation and degradation to fish habitat. Road maintenance poses little effect on fisheries. Tables III-1a, b and c show the estimated miles of open and closed roads by alternative.

Road closures will decrease the amount of disturbance to wildlife species from vehicles and maintenance equipment. Closure by obliteration creates habitat through successional stages for different species but loses the characteristics found in habitat associated with edges. Species whose habitat may be fragmented by roads will benefit from road obliteration. Closed roads used as linear wildlife openings provide forage for many species.

Cross-country motorized vehicle travel

OHV travel risks damage to wildlife habitat and possible direct injury or mortality to individual animals. Wildlife populations may be adversely affected by disturbance from this activity. It is unlikely that any non-PETS species will decrease below viable population levels due to this activity. Many species are very sensitive to minor disturbances during nesting season. OHV use adversely affects turkey nesting success. Once brooding hens are flushed from their nests, they frequently do not return (Still and Baumann, 1990; Bidwell, 1985; Hillestad, 1973). Off-trail OHV use may also lead to habitat alteration which will affect various wildlife species.

Off-trail OHV use may damage fish habitat by sedimentation and alteration of the creek bottoms at stream crossings.

Tables III-1a, b and c illustrate the relative variation of the restrictions placed on off-trail OHV travel among alternatives.

Constructing wildlife openings; maintaining wildlife openings

Constructing and maintaining wildlife openings poses minimal risk of direct injury or mortality to some wildlife species. Habitat is altered by increasing early successional habitat. Wildlife openings also create edge habitat. Some species will benefit while others will not. While many wildlife species utilize these openings, the eastern wild turkey benefits greatly from these openings. These areas are used as bugging areas for young poults and adult birds as well. Openings provide grasses and forbs and a variety of conditions in contrast to the dense vegetation emerging after the hurricane. Openings have little risk to water quality and fish habitat.

The effect of the edge habitat created by wildlife openings is often magnified if in close proximity to agricultural land and other openings. Some neotropical migrants are especially vulnerable to predators and brood parasites, such as the brown-headed cowbird, associated with edge habitat. The effects of such predators and parasites are minimized by the location and size of the openings. If new construction of wildlife openings follow the current criteria such as small size (usually 2 acres or less) and the typical location (usually in upland pine areas adjacent to previous disturbances or naturally occurring openings), wildlife openings will not significantly contribute to an increase in forest fragmentation.

Maintaining these areas can change the existing vegetation, depending on the species planted. Non-native species such as some clovers and legumes are often planted in these areas. The emphasis on native verses non-native species varies by alternative. (See chapter 2.) Many non-native species benefit wildlife, but there is a slight risk that they may out compete native vegetation in the area.

Tables III-1a, b and c show the estimated acres of wildlife openings planned for construction and maintenance by alternative.

Converting pine stands to mixed stands

The effects of the methods of conversion are discussed under the harvesting and regeneration sections. This section will deal with the effects resulting from mixed stand management. The effect on fisheries is insignificant. The tree species composition will change thereby altering the habitat. This will benefit some wildlife species but not others. The hardwood component will increase and mast production will increase.

Several species favor the habitat of mixed forest types such as various species of hawks and the Eastern fox squirrel. No known species is restricted to this type of habitat (Stewart, 1985). Forest management practices that increase within-stand diversity generally favor wildlife (Marion and Harris, 1981). Mixed stands usually have a greater midstory component which may benefit some species including a variety of songbirds, but not others such as quail. Tables III-1a, b and c show the estimated acres converted to mixed stands by alternative.

Converting loblolly to longleaf pine

The effects of the methods of conversion are discussed under the harvesting and regeneration sections. This section will deal with the effects resulting from managing longleaf stands. The effect on fisheries is insignificant. The management associated with longleaf pine will benefit some species but not other wildlife species. A more intensive prescribed fire program is associated with longleaf stands. Effects of prescribed fire are discussed later. Tables III-1a, b and c show the estimated acres converted from loblolly pine to longleaf pine by period by alternative. Red-cockaded woodpeckers, quail, and fox squirrels are some species which are likely to benefit from the conversions. The effects on most wildlife species will probably be minimal. The more notable effects are associated with harvesting trees.

Harvesting trees

Harvesting trees risks injury or mortality to individual animals. Regeneration harvests produce early successional habitat, edge habitat, and a variety of forest age classes. Harvested areas, if interspersed in a mosaic pattern throughout the Forest, are the preferred habitat for a variety of species. Openings created by harvests are critical for many wildlife species especially considering the dense growth of trees and shrubs following Hurricane Hugo. Some examples of early successional species which may benefit from harvest include the white-tailed deer, eastern bluebird, white-eyed vireo, and yellow-breasted chat. Mourning doves and small mammals such as cotton rats are attracted to early successional habitat (McComb and Hurst 1987; Perkins 1973). Longer rotations translate to less cut annually which may benefit late successional species such as the eastern wild turkey, eastern gray squirrel and fox squirrel, and pileated woodpecker. Older stands usually have more snags and available cavities which benefit many species of wildlife like squirrels and woodpeckers. Removal of shading vegetation may adversely affect reptile and amphibian species. Fallen trees eventually create cover for amphibians and sunning sites for reptiles.

Regeneration harvests may contribute to forest fragmentation, depending on the location and size of the harvested area. Many interior forest dwelling birds are extremely sensitive to forest fragmentation. As a result of the hurricane, the projected regeneration harvest levels are low in all alternatives, and the effects on wildlife populations from forest fragmentation are insignificant. All alternatives meet the requirement for maintaining at least viable populations of all native and desired non-native wildlife populations (in the case of PETS species viable populations are the goal). Harvesting activities may harm fish and other aquatic organisms if soil disturbance results in stream siltation. These activities may affect fisheries by removing stream-side shade, which may increase the water temperature. These effects are minimized by standard mitigating measures.

Thinning harvests generally have a beneficial effect on wildlife species. Thinnings will increase the amount of sunlight to the forest floor allowing the understory vegetation to flourish. This will provide forage for many animal species such as deer and a variety of songbirds. Thinnings open up the canopy which directly benefits open canopy-obligatory species such as yellow-breasted chat and prairie warbler (Crawford, et al 1981). Thinning may also increase the health and vigor of the stand which enhances the future habitat for species which prefer mature stands, such as the Carolina Chickadee, white-eyed vireo, and wood thrush. These bird species may temporarily decline until the canopy closes again. Thinnings, if selective against hardwoods, may decrease the amount of hard mast. However, if hard mast-producing hardwoods are released during the thinning harvest, species such as deer, turkey and squirrel may benefit.

Figure II-5 illustrates the number of acres of early successional habitat created as a result of scheduled pine regeneration harvests. Tables III-1a, b and c show the probable harvest acres by alternative.

Establishing regeneration

The effects on wildlife associated with site preparation for establishing regeneration are discussed in the R-8 FEISVM, pages IV-52—IV-76. Production of preferred deer forage and soft mast can increase for several years following initial reduction after site preparation. The growth of grass, forbs, and vines is often associated with regeneration, and this improves conditions for ground-feeding birds including quail and wild turkey by increasing seeds and forage (Hurst and Warren 1986). The amount of hard mast may decrease. Regeneration areas are often used as escape cover and nesting cover for many species. Retention of snags in regeneration areas greatly increases use by cavity nesters and raptors (hawks and owls) as well as insect-feeding birds. Through the harvest and regeneration of stands, a mosaic of forest types is spread across the forest landscape. Over time, habitat is provided for many different species of animals. This cumulative effect increases among-stand wildlife diversity even though within-stand diversity for a particular site may decrease.

Various methods for establishing regeneration risks soil disturbance which may result in stream siltation thereby degrading fish habitat. Site preparation may affect fisheries if excessive slash is placed in streams. Excessive slash reduces dissolved oxygen in streams and traps sediment which can harm fish population. Small amounts of slash in streams can enhance fish habitat. The effects are minimized by standard mitigating measures. See Tables III-1a, b and c for a list of estimated acreages of regeneration.

Prescribed burning

Most animals found in the Coastal Plain region are adapted to periodic fires; therefore, direct mortality from prescribed fire has a negligible effect upon wildlife populations (Lyon and others, 1978). Prescribed burning also

reduces risk of a catastrophic wildfire and resulting animal mortality. Even less mobile species such as some small mammals, reptiles and amphibians are able to escape damage from fire by burrowing and finding protection. The maintenance of many species such as quail are dependent upon fire (Landers, 1987).

Although it is possible for direct heating of small streams by fire to result in the mortality of aquatic organisms, mitigation measures do not allow prescribed fires to achieve the intensities or duration necessary for this to happen. Most burns stop before reaching streams. Any mortality would be restricted to short stretches of water. Intense fires may destroy ground cover and increase sedimentation risk on small streams; however, in the coastal plain prescribed burns have little impact on fish populations (Seehorn, 1987).

The effects of prescribed fire on wildlife habitat depends on the season of burn, fire intensity, and frequency of burns. Nutrient content (particularly protein and phosphorus) and preference of forage for deer generally increase temporarily after burning. Many small mammals which feed on seeds and grass need the early successional forest stages created or maintained by fire. Prescribed fire reduces external parasites, maintains brood habitat, and increases the insect, seed grasses and legume food supply for species such as wild turkeys and quail. The enhancement of wild legumes is one of the most significant effect of fire (Landers, 1981). Frequent hot fires may damage nesting and escape cover which could lead to high predition rates in some species such as quail. (Landers, 1981)

Few birds die in fires, but burning alters bird habitat and the guild composition of bird communities. (Dickson, 1981) Burning may temporarily open up a stand and attract predatory birds. Birds associated with pine stands, such as brown-headed nuthatches and pine warblers, should benefit from burning (Dickson, 1981). Bird species associated with early successional habitat should also benefit such as the prairie warbler, yellow breasted chat, common yellow throat, Bachman's sparrow and indigo bunting (Johnston and Odum 1956, Meyers and Johnston 1978, Dickson and Segelquist, 1979). Songbirds associated with the hardwood or shrub component of pine/hardwood stands would probably be reduced as the hardwood component or midstory component decreases (Dickson, 1981). The white-eyed vireo, hooded warbler, Carolina wren, and black and white warbler are examples of species that utilize the shrub and midstory vegetation component which may be affected by intense and frequent burning. If prescribed fire reduces hardwoods, insect-eating birds may suffer. A reduction in midstory could also reduce the foraging strata available for birds who eat insects off deciduous foliage such as flycatchers (Via, 1979). Bird abundance and diversity would probably be enhanced by fires that result in patchy vegetation (Dickson, 1981).

During the breeding season of songbirds, insects are the primary diet. In fall and winter, insectivorous birds comprise a small portion of bird communities (Dickson, 1979), and the main bird diet is fruits and seeds (Martin et al, 1951). Prescribed burning can have both positive and negative effects on soft mast production. In the short-term, mast production by numerous shrubs such as blackberry and dwarf huckleberry may be reduced, while seed production by grasses, spurges, and legumes is often increased shortly after burning. A few years after burning, shrubs often produce peak mast crops while production by grasses and legumes declines (Harlow and Van Lear, 1989).

Hard mast-producing shrubs such as runner oak (*Q. pumila*) and dwarf live oak (*Q. minima*) appear to have reduced acorn production the first year after prescribed fire, but production increases by the second growing season. The fruit from these species are utilized by wild hog, turkey, quail, deer, bear, birds, and small mammals. Oak mast, a high carbohydrate food, may be particularly important during years when late summer drought curtails production of wild legumes on sandy, coastal plan soils (Lander, 1981). In a study on live oak in the Coastal Plain of east Texas, results after one year indicated that burning adversely affected mast production (Springer, 1977). Generally, acorns in the duff of the forest floor are quickly consumed by ground fire.

Hardwood species are generally less resistant to fire damage than pine (Wade, 1983). Young hardwoods can be injured or killed by fire which indirectly reduces the future production of mast. Low intensity prescribed burns have little to no adverse effect on stem quality of medium to large mature hardwoods (~6-15") (Sanders, Van Lear, and Guynn; 1987). Growing-season burns intensify the effects and hardwoods may experience more damage which may adversely affect mast production. In the long term, prescribed fire may be necessary to establish oak regenerating for future mast production by controlling less desirable hardwoods. There is a research need to study the effects of fire on mast production in pine, hardwood, and mixed-pine hardwood stands in all physiographic areas.

Prescribed fire can destroy snags and cavity trees that are of immediate importance to cavity nester foraging and reproduction. However, in the short-term, the number of snags available as potential foraging sites may increase.

Prescribed burning is probably beneficial to most amphibian and reptile species inhabiting pine forests of the southeastern US (Means and Campbell, 1981). Habitat created from down logs may be destroyed by fire; however, most habitat for reptiles and amphibians is improved. Very few individuals are killed during fire except for the eastern glass lizard. (See PETS animals.)

For more discussion of the effects of prescribed fire on wildlife see the R-8 FEISVM, pages IV-69-73. The estimated acres of prescribed burning by season by alternative are displayed in Tables III-1a, b and c.

Applying herbicide

Wildlife can be exposed to herbicides though skin contact, inhalation and ingestion. For aquatic species, exposure may occur from herbicides that move off-site. For information on herbicide exposure and dose response on wildlife see the R-8 FEISVM pages IV-55-64. Herbicides have an indirect effect on wildlife by altering vegetation species composition and structure. The use of herbicides can create snags which provide perching sites for raptors. Snags also provide potential nest sites and foraging habitat for cavity-nesting and insect-feeding birds. Herbicide use may reduce or increase mast production, grasses and forbs depending on the objective and method of the application. A reduction in mast-producing hardwoods can have a detrimental effect on deer, turkey, gray squirrels, and many species of songbirds. Pine seed production may increase which benefits fox squirrels and other species. Herbicide may help control persistent non-native grasses to enable native or other desired grasses, legumes, and forbs to become established. Applying herbicides may also alter the vegetative structure. Escape cover and nesting cover may be created or destroyed. For more information on the effects of herbicides on wildlife habitat see R-8 FEISVM, pages IV-64-69. Tables III-1a, b and c display the relative potential use of herbicide by alternative.

Timber stand improvement

These activities may occasionally cause direct injury or mortality of animals or result in damage to the eggs or young; however, most vertebrate species are able to escape harm. Disturbance from these activities may cause abandonment of young or nests. There is a slight risk of adversely affecting fish habitat through increased stream siltation from soil disturbance. Most of these activities increase the number of plant species and amount of herbaceous ground cover compared with untreated areas. Small seed-eating mammals often benefit as do larger species such as deer from the increased forage found in treated areas. Ground cover used for nesting or escape may be increased or decreased depending on the method of treatment. Effects such as creating snags, early successional habitat for cover and food, and increasing or decreasing grass, forbs, and mast production are similar to those discussed in the prescribed burning and herbicide sections. These activities may increase either within-stand diversity or between-stand spatial diversity which generally favors wildlife use (Marion and Harris, 1981). More information on the effects of vegetative management on wildlife can be found in the R-8 FEISVM pages IV-52-76. Tables III-1a, b and c show the estimated acreages of type of timber stand improvement by alternative.

Managing hardwoods in pine stands; managing transitions and inclusions

The effects of activities used in managing hardwoods in pine stands are very similar to the effects of prescribed fire, herbicides, and timber stand improvement. Such activities risk injury to individual animals, but has negligible effects on the population as a whole. The effects on fish populations are negligible. An increase in mid-story hardwoods will benefit some species of songbirds but will be detrimental to other wildlife species. The amount of available grasses and forbs may decrease if the amount of prescribed burning decreases. As the hardwoods mature, the stands will provide more mast. Many species such as deer, turkey, squirrel, and rodents will benefit from greater variety of available mast such as acorns and pine seeds as well as other nuts and fruit. Since acorns are produced primarily on foliage exposed to full sunlight and yields increase with tree size, thinning theoretically should increase mast yields. Although there is little documented evidence to support this theory, the management of hardwoods could include favoring mast producers while removing competing vegetation (Beck, 1989).

Managing transitions will allow more opportunities for wildlife species to travel between habitat types. Wildlife diversity increases as the number and variety of available habitats increases. Transitions between wet and dry habitats, pine and hardwoods, or upland and lowlands provide habitat with unique characteristics. Preferred habitat for species such as the American Swallow-tailed Kite includes these areas. The management of inclusions will create a more diverse landscape and support a variety of wildlife species. Mast component, both hard and soft, will generally increase, benefiting many wildlife species. Acorns and other nuts from a variety of hardwood associated in these areas are desirable high energy food for many species including deer and turkey. In addition, acorns require little energy expenditure to acquire (Kirkpatrick, 1989). Tables III-1a, b and c show a relative comparison of transition and inclusion management by alternative.

Proposed, Endangered, Threatened and Sensitive Animals

Current Condition

Several PETS animal species are found on the Forest including 4 federally endangered species, 1 threatened, and 11 species which are considered sensitive by South Carolina. Three sensitive species of amphibians, the flatwoods salamander, eastern tiger salamander and the gopher frog, are found here. There have been no confirmed reports of either salamander on National Forest land in recent years. Monitoring efforts in 1991 failed to identify any specimens. There is, however, a known population adjacent to the Forest on the Santee Coastal Reserve. One gopher frog has been identified during one of these surveys. However, the status of the population cannot be determined with the limited observations. Another sensitive species, the northern pine snake, is found on the Forest. Little is known about the population status of this species. Several pine snakes have been identified. Since the amount of suitable habitat has remained relatively constant, it is assumed that the populations of these species are also stable. One reptile, the American alligator, is listed as threatened due to similarity of appearance to the American crocodile.

Four bird species are federally listed as endangered: red-cockaded woodpecker (RCW), Bachman's warbler, bald eagle and wood stork. The Forest supports one of the largest and fastest growing populations of red-cockaded woodpeckers in the world. Before the hurricane, the Forest supported 477 clusters. It now supports about 395 red-cockaded woodpecker clusters and is home to about 333 breeding pairs. About 79 percent of the breeding pairs nested successfully in the 1993 nesting season. The Forest is currently managing for the red-cockaded woodpecker under the 1990 "Interim Standards and Guidelines for the Protection and Management of Red-cockaded Woodpecker Habitat Within 3/4 Mile of Cluster Sites." The red-cockaded woodpecker management map, alternative C, shows the current location of the red-cockaded woodpecker clusters found on the Forest and their associated zones of management.

Although suitable habitat for the Bachman's warbler can be found on the Forest, the last confirmed sighting was in 1963 on private land. There are five bald eagle nests within the Forest's boundaries; only one is on Forest Service land. The wood stork may be seen in swamps and on the coastal edges of the Forest as a transient, but they do not nest here. The nearest rookery is in Colleton county. An estimated 600 pair nest in the ACE basin, an area comprised of the Ashipoo, Combahee, and Edisto rivers.

Bachman's sparrow, loggerhead shrike, and Henslow's sparrow are Forest sensitive species and are candidates to be included on the federal threatened and endangered list. The Bachman's sparrow is a local breeder. Loggerhead shrike is an uncommon resident; however, transient birds may be seen in the winter. Sightings have increased since Hurricane Hugo. Henslow's sparrow is a rare to uncommon winter visitor. This species generally nests further north near North Carolina's coastal plain. American swallow-tailed kite is of special concern to the state and is also included as a Forest sensitive species. It is a fairly uncommon, local breeder on the coastal plain of South Carolina. There are currently approximately 60 pairs nesting on the Forest and another 20 pair on adjacent private land. This population represents the most northern nesting population of American swallow-tailed kite in the world.

Two mammals, the eastern wood rat and the Rafinesque's big-eared bat, are candidate species for inclusion on the federal threatened and endangered list. The number of eastern wood rats on the Forest is unknown; however, regional population trends indicate a declining population. Rafinesque's big-eared bat is a rare bat of the southeastern U. S. Its distribution and current status are not well known. This species is currently listed as endangered by the state of South Carolina. Historic records suggest that coastal populations have declined. Before the hurricane, only one colony of this bat species was found in an old abandoned building near Walnut Grove; however, the building was damaged during the hurricane rendering it unsuited for bat habitat. There are no known colonies on the Forest. There is a colony of less than 100 Rafinesque's big-eared bats near the Forest on state-owned Hampton Plantation.

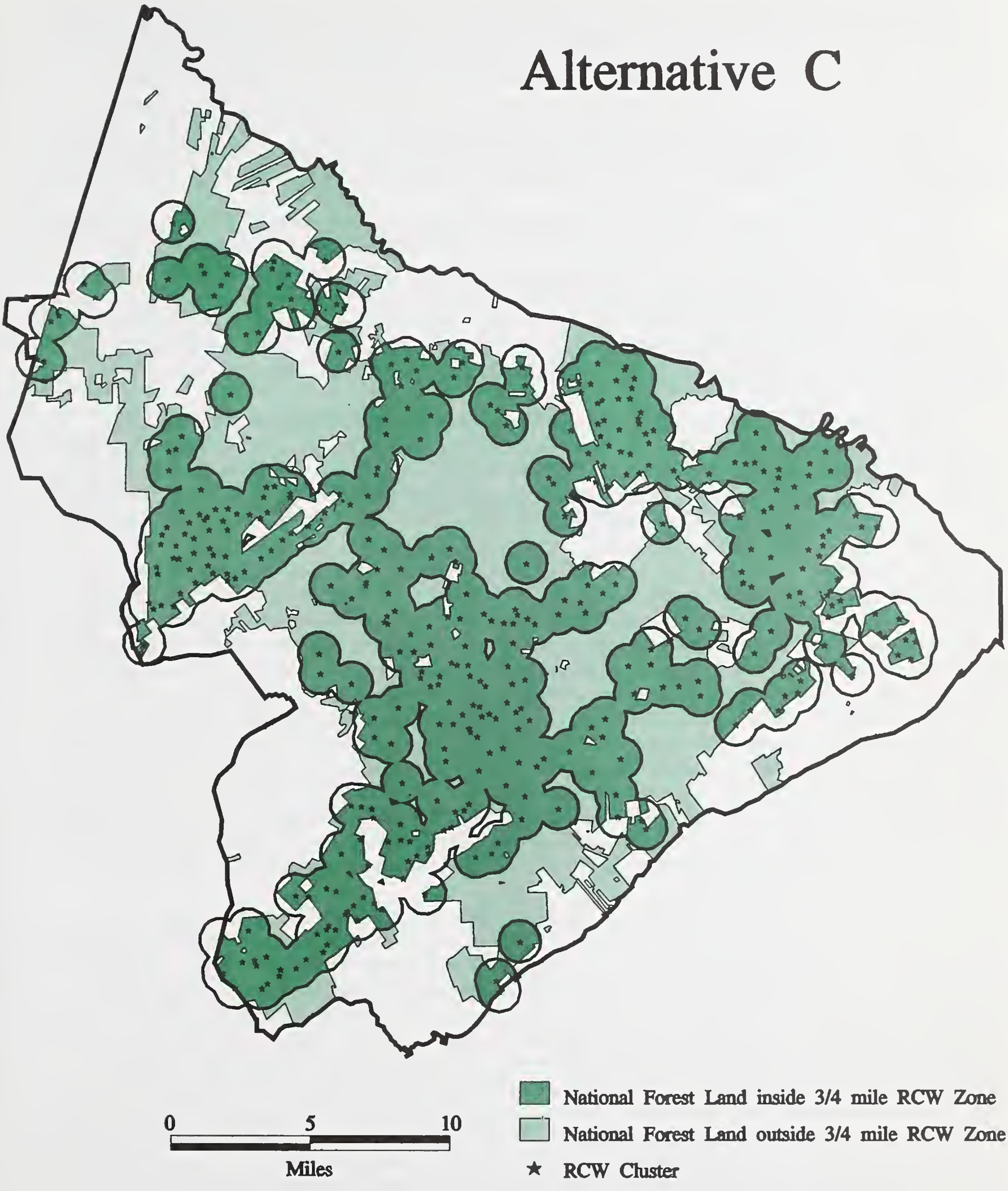
A small population of black bears live on the Forest. The black bear is a species of special concern in the coastal plain of SC and is also included on the Forest's sensitive species list. The population is believed to be increasing because the number of bear sightings and signs have increased. State wildlife officials are also receiving more calls to move nuisance bears from areas adjacent to the Forest. A study is being conducted through Clemson University to estimate the status of this coastal population.

The only endangered fish species which may inhabit waters adjacent to the Forest is the shortnose sturgeon. Although there have been no confirmed sightings of this species, the shortnose sturgeon may still exist in the Santee river.

(NOTE: For a list of proposed, endangered, threatened and sensitive species found on the Forest see appendix D.)

RCW Management

Alternative C



Environmental Consequences

Effects by Alternative

General effects resulting from vegetative management, timber harvest, recreational activities, construction and maintenance of trails and roads, and other management activities are presented in the wildlife section. These effects also apply to proposed, endangered, threatened and sensitive (PETS) animal species. Additional evaluations including site-specific biological assessments (BAs) and biological evaluations (BEs) are required to ensure that these PETS species are protected when any project is proposed. Recovery plans and Forest Service Handbook chapters have been prepared for several PETS species. These documents serve as guidelines for the protection and maintenance of viable populations of the species. These guides are common in all alternatives. Also constant throughout the alternatives is the Forest Service's legal obligation to adhere to the Endangered Species Act (ESA) (16 U.S.C. # 1531-1544).

The previous section describing the effects of each alternative on wildlife highlights the management emphasis, major activities and factors which influence populations of wildlife. These same items will also affect PETS species. Discussion of the effects on many PETS species is found in the wildlife section. Due to the condition of the Forest, effects to PETS species will only slightly differ during the first two planning periods. Differing effects to PETS species will begin to be realized when the Forest reaches the desired future condition. Habitat for the bald eagle, wood stork, Bachman's warbler, American alligator, Rafinesque's big-eared bat, and black bear will not be significantly different for all of the alternatives in the long term. Therefore, effects are expected to be similar for all alternatives.

Because of the forest-wide HMA for red-cockaded woodpeckers and the emphasis on maintaining natural ecosystems in alternative A, the landscape will be dominated by large, old, widely-spaced pines with open understories. This condition will provide optimum habitat for the RCW, Bachman's sparrow, Henslow's sparrow (wintering), flatwoods salamander and northern pine snake. Large trees available for bald eagles will be abundant throughout the Forest. Habitat for wood storks will be found primarily along the coast, and large swamps will provide resting and roosting areas. Aquatic systems will be largely unchanged in all alternatives, and habitat for the American alligator should remain the same. These habitats will also support populations of flatwoods salamanders, gopher frogs and eastern tiger salamanders. Because of the open condition of the Forest, habitat for the loggerhead shrike will be present, mostly in the open pine stands. The wetter pine sites will retain their suitability for swallow-tailed kites. These wetter areas, as well as hardwood areas, will provide habitat for the eastern wood rat. There are a few black bears on the Forest, primarily in the larger bay areas. This habitat will be maintained in a natural condition, providing habitat for the black bear. Rafinesque's big-eared bat is primarily found in mines, tunnels, and old buildings and habitat for this species is not expected to change in any of the alternatives. The Bachman's warbler is considered by some to be extinct. The late successional condition of the Forest in this alternative may not provide suitable habitat for the Bachman's warbler. Mature hardwood stands with a disturbed canopy and an understory of dense vegetation is often described as preferred habitat for the Bachman's warbler. Such habitat, in all alternatives, will most likely result from natural disturbances such as hurricanes. Forest fragmentation will be at its lowest in this alternative, and no secondary effects of fragmentation are expected to significantly affect any of the breeding birds, such as the Bachman's sparrow. Although impacts to PETS species is low in all alternatives, this alternatives imposes the least impacts to PETS species.

In alternative B, conditions within the RCW HMA will provide sufficient habitat for the RCW, Bachman's sparrow, flatwoods salamanders, Henslow's sparrows (wintering) and the northern pine snake. Additional habitat for the loggerhead shrike and Bachman's sparrow will be available in regeneration areas outside of the HMA. Additional food sources for the black bear will also be found in these areas in the form of soft mast until these stands develop an overstory canopy. Large trees available for bald eagles will be found throughout, and wood stork habitat will remain unchanged. Aquatic habitats will also remain unchanged, supporting gopher frogs, eastern tiger salamanders and American alligators. Disturbance on the pine sites outside the HMA may affect populations of flatwoods salamanders on longleaf sites. Bachman's warbler habitat will decline as the Forest matures and suitable habitat will be found in hardwood areas with a disturbed canopy. Swallow-tailed kite should remain stable unless wet loblolly sites are scheduled for timber management. These wetter pine sites and hardwood sites are suitable for wood rats, and if wetter sites with a dense understory are managed for timber, populations of the wood rat may decline. Effects of forest fragmentation are not expected to be high. Bachman's sparrow habitat will be abundant and brood parasitism and nest predation on this species are not expected to be significant.

In alternative C, effects to the bald eagle, wood stork, Bachman's warbler, American alligator, eastern tiger salamander, gopher frog and Rafinesque's big eared bat will be similar to alternative B. RCW will be at a recovered level in the long term. In habitat managed for RCW and where pine stands are frequently burned, Bachman's sparrows, northern pine snakes, and Henslow's sparrows (winter) will be present. In alternative C, more land is suitable for timber production, which may impact populations of pine snakes and flatwoods salamanders (in longleaf pine types). Any regeneration in the wetter loblolly pine sites could eliminate some nesting habitat for the swallow-tailed kite and the eastern wood rat. Bachman's sparrow and loggerhead shrike habitat will also be found in areas where pine is regenerated. Increase in soft mast after timber harvest will provide additional food sources for black bear.

In alternative D, RCW will be at a recovered level in a forest-wide HMA. Effects to other PETS species will be similar to those in alternative A. More early successional habitat will be available than in alternative A which will benefit the Bachman's sparrow, Henslow's sparrow and loggerhead shrike. Habitat for the flatwoods salamander, eastern tiger salamander, and gopher frog will be abundant in the longleaf pine types. Habitat for the swallow-tailed kite and eastern wood rat should be available if wetter pine sites are not frequently burned or harvested. Impacts to reptiles and amphibians will possibly be higher in this alternative due to the impacts of recreational construction and concentrated off-road use.

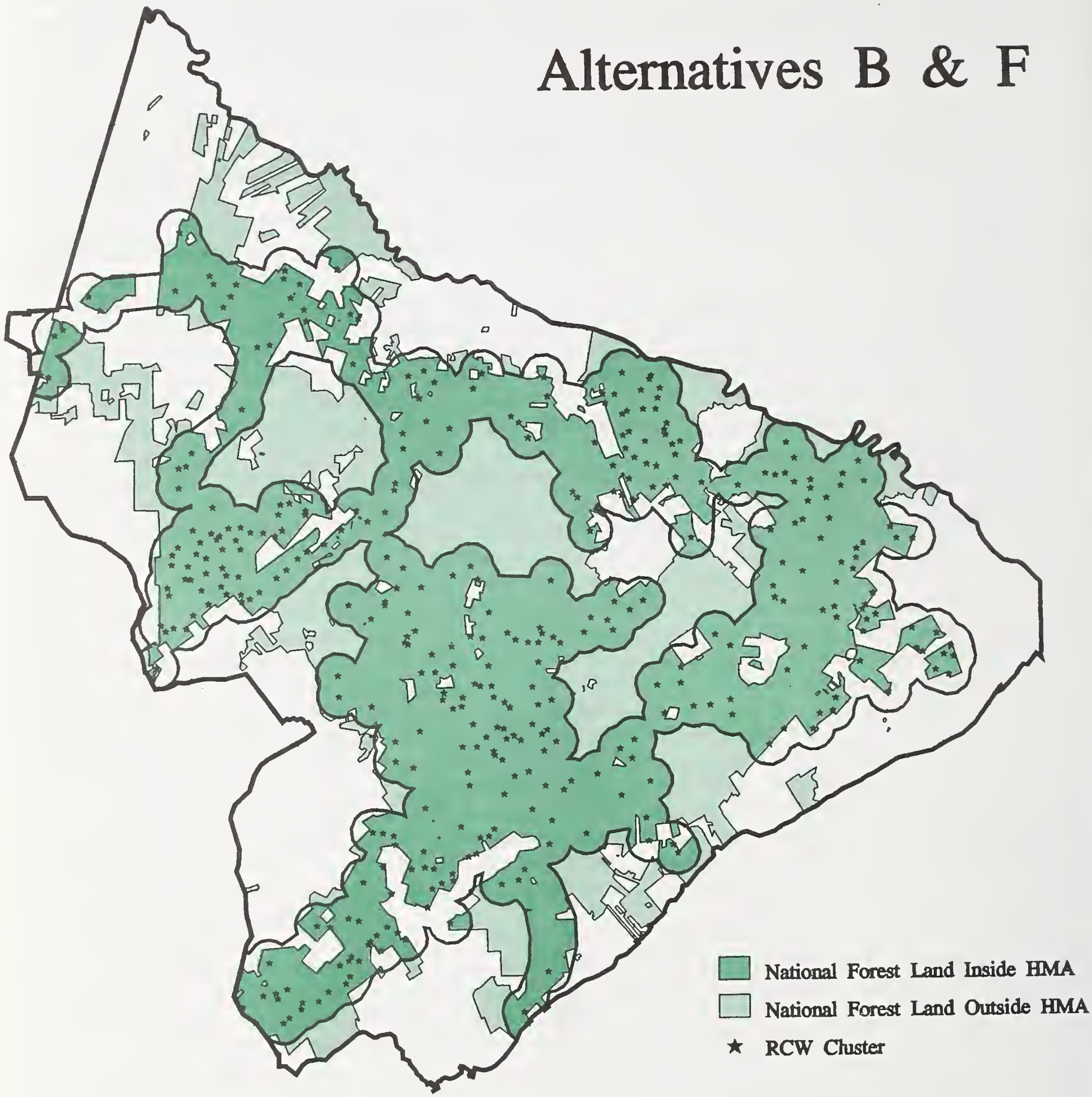
In alternative F, RCW will be at recovered levels in a HMA that encompasses about 2/3 of the Forest. Those species that inhabit longleaf pine ecosystems will increase (reptiles and amphibians, Bachman's sparrow). There will be suitable habitat within and outside the HMA for Bachman's sparrow, Henslow's sparrow and loggerhead shrike. Impacts to these species will be higher outside of the HMA where more timber harvest may occur. Habitat for the swallow-tailed kite and eastern wood rats will be present, especially in those areas that provide corridors between wilderness areas. Impacts to PETS species in this alternative is less than all other alternatives except alternative A.

The following maps show the areas of the Forest under RCW management by alternative. Alternatives A and D have Forest-wide HMAs and are not illustrated.

Additional effects of alternatives for the management of the RCW are found in the R-8 RCW DEIS.

RCW Management

Alternatives B & F



Effects of Probable Activities

Constructing developed recreational facilities; constructing trails; maintaining developed recreational facilities; maintaining trails

PETS populations are generally more sensitive than other wildlife populations to disturbance from these activities. The risk of harm to the species as a result of increased stress, or abandonment of young or nest would be greater if these activities occurred during breeding and nesting season. The effects are much less for maintenance verses construction. Damage to critical habitat associated with each PETS species resulting from construction or from increased public use will have a greater impact on PETS populations than on other wildlife populations. Tables III-1a, b and c show the estimated number of recreational facilities and the estimated miles of trails constructed by alternative.

Charge user fees

This activity will have little effect on PETS.

Closing roads; constructing roads; reconstructing roads; maintaining roads

PETS populations are more sensitive to disturbance than other wildlife populations. Constructing roads during the nesting season of the red-cockaded woodpecker may adversely affect this federally endangered species. (See R-8 RCW DEIS.) Freedom from constant disturbance, i.e., open roads, is considered the most important habitat need for the black bear (Lentz, 1980; Carlock et al., 1983; Hamilton and Marchinton, 1980; Miller, 1975; Pelton, 1980; Brody, 1984). The greater the number of open roads, the greater is the risk of disturbance to all species. Tables III-1a, b and c show the estimated miles of road reconstruction by alternative. Tables III-1a, b and c show the estimated miles of roads to be closed by alternative.

Cross-country motorized vehicle travel

PETS populations are more sensitive to disturbance than other wildlife species and populations may be adversely affected as a result from the increased disturbance. Concentrated OHV use during nesting season may also have adverse affects on red-cockaded woodpecker due to disturbance. A comparison of off-road and off-trail vehicle access is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

Some species may benefit, such as the loggerhead shrike who prefers open grassy woodlands and Henslow's sparrow; however other species may not benefit. Wildlife openings provide edge which creates habitat for some predators such as raccoons, edge-loving birds and brood parasites including the brown-headed cowbird. This may be detrimental to some PETS species. Tables III-1a, b and c show the estimated acres of wildlife openings by alternative.

Converting pine stands to mixed stands

Mixed stands often have a greater mid-story component which may be detrimental to red-cockaded woodpeckers if in close proximity to a cluster. A reduction in the number of pine stems per acre will increase the area needed to provide RCW foraging needs. Henslow's sparrow may benefit if the structure of such stands allows for grass/shrub component. Mixed stands would also probably benefit black bear as a result of increase forage and availability of hard and soft mast. See Tables III-1a, b and c for the estimated acreages of this treatment.

Converting loblolly to longleaf pine

Red-cockaded woodpeckers and Bachman's sparrows, which prefer longleaf pine and the associated fire management regime, will benefit from these conversions. The conversion and associated management would also probably benefit the flatwoods salamander in the long term. See Tables III-1a, b and c for the estimated acreages of this treatment.

Harvesting trees

PETS species which prefer some open habitat will benefit from harvesting trees. Some examples include Bachman's sparrow, Henslow's sparrow, loggerhead shrike, and Bachman's warbler. Black bear may also benefit from occasional openings which offer a variety of fruits and other soft mast in the early years following harvest. Removal of shading vegetation may adversely affect the habitat of the flatwoods salamander if harvest occurs within its critical habitat. Thinning harvests may benefit red-cockaded woodpecker, Bachman's sparrow, loggerhead shrike, and Henslow's sparrow which use open pine stands with low or grassy understories. Thinning is crucial to provide adequate foraging for the RCW. The swallow-tail kite may also benefit from thinnings because the health of large loblolly will probably increase and these are preferred for nesting. Some PETS species of reptiles and amphibians such as the flatwoods salamander, island glass lizard and northern pine snake which prefer an open grassy understory during parts of their life-cycles may benefit from thinning. See Tables III-1a, b and c for the estimated amount of harvest by alternative.

Establishing regeneration

The more ground disturbing the regeneration method and the greater acreage, the greater will be the risk of disturbance to PETS species. The growth of grass, forbs, and vines is often associated with tree regeneration, and this may improve conditions for ground-feeding birds such as the Bachman's sparrow, loggerhead shrike, and Henslow's sparrow. Regeneration areas are often used as escape and nesting cover for these species. Periodic regeneration is required to sustain long-term habitat for many PETS. See Tables III-1a, b and c for the estimated acreage of regeneration by alternative.

Prescribed burning

Most of the PETS species found on the Forest are adapted to periodic fires associated with the Coastal Plain region; therefore, most species would benefit from such activities or not significantly be affected. Some PETS species which would benefit from prescribed fire include the red-cockaded woodpecker, flatwoods salamander, Bachman's sparrow and Henslow's sparrow. Periodic burning helps to temporarily provide open conditions which often attract predatory birds such as the loggerhead shrike. Fire may degrade the habitat for species which use woody understory. Some lizard species can sustain considerable mortality from fire. (Mean & Campbell, 1981).

The production of fruits and other soft mast may increase the first year after a burn which will benefit the black bear. In coastal regions, winter burns on a three year rotation are recommended for pine plantations and flatwood habitat (Hamilton, 1981). This is optimal for fruit production such as blackberries, blueberries, huckleberries and gallberries, which are important food sources for black bear from late spring through early fall (Landers et al, 1979). Summer burns, however, could deprive bear of other foods such as hard mast (Hamilton, 1981). Food sources such as yaupon, American holly, sparkleberry, black gum and dogwood berries may be adversely affected by frequent fires. Burns may also stimulate herbs and grasses/sedge production. Herbaceous material is the primary food source for black bear in the spring on the coastal plains (Hamilton, 1981). For a more detailed discussion of the effects of prescribed fire on PETS species see R-8 FEISVM, page. IV-79. See Tables III-1a, b and c for the estimated acres of prescribed burning by season by alternative.

Applying herbicide

When applied correctly, most herbicides do not pose a significant risk to any PETS animal species. Accidental spills of chemicals pose a significant risk to aquatic species such as the shortnose sturgeon. For more information on the effects of herbicides on PETS animal species and their habitat see the R-8 FEISVM, pages IV-77-79. Tables III-1a, b and c display the relative potential use of herbicides by alternative.

Timber stand improvement

Many PETS species depend on certain timber stand improvement activities to provide suitable habitat. For example, pine stands are often thinned to provide a certain basal area in order to promote optimum foraging and nesting habitat for the red-cockaded woodpecker. See the RCW DEIS for further information. More information on the effects of vegetative management on PETS species can be found in the R-8 FEISVM, pages IV-76-79. Tables III-1a, b and c show the acres by type of timber stand improvement by alternative.

Managing hardwoods in pine stands

A greater amount of hardwoods in the mid-story may benefit some species of birds such as the Bachman's Warbler, but may be detrimental to other wildlife species. An abundance of mid-story hardwoods will be detrimental to red-cockaded woodpecker management and can lead to cavity abandonment. In all alternatives, midstory pine and hardwoods will be controlled within 200 feet of woodpecker cavity trees. As the hardwoods mature, the stands will provide a greater mast component which may be beneficial to black bear. See Tables III-1a, b and c for a comparison among alternatives in their emphasis of hardwood management.

Managing transition and inclusions

Activities associated with managing transitions and inclusions will have very little effect on most of the PETS species. Managing transitions will allow more opportunities for PETS species to travel between habitat types. This will benefit black bear as well as the gopher frog. Transitions between wet and dry habitats, pine and hardwoods, or upland and lowlands provide unique habitats. The American swallow-tailed kite will benefit because its preferred habitat is in transition areas. See Tables III-1a, b and c for comparison among alternatives in their emphasis of hardwood management.

Insects and Diseases

Current Condition

Insects and diseases are a significant component of forest ecosystems. They contribute to many ecological processes including nutrient recycling, plant succession, and forest dynamics. In some cases, however, these organisms cause unacceptable resource damage or loss and adversely impact ecological, economic, or social values. When this happens, these organisms are referred to as forest pests. Some of the most common insects which may be pests are: southern pine beetle (SPB), Ips beetle, Pales weevil, black turpentine beetle, pine sawfly, pine tip moth, and tent caterpillars. Common diseases which may be pests are: fusiform rust, annosus root rot, red heart, and brown spot needle blight.

Southern pine beetle populations reached outbreak status by the spring of 1990 after Hugo and lasted through the summer. Southern pine beetle first appeared in the residual loblolly and longleaf stands on the eastern side of the Forest. Longleaf pine, which is normally not a preferred host, was stressed by Hugo and subsequent drought to the point that beetle attack was often fatal. As the pine recovered from the stress, the number of southern pine beetle infestations declined. The stocking levels of the pine stands had been so reduced by the hurricane that by the end of the summer, southern pine beetle populations declined below outbreak status.

In the fall and winter of 1989, Ips bark beetle populations and blue stain fungi built up in slash and downed timber. Ips and blue stain first appeared in broken-off tops, then windthrown trees, next in standing boles with tops removed, and about midsummer, in standing trees around logging decks and along skid trails where root damage had occurred. Drought conditions prevailed the following spring and summer (1990) predisposing the young pine plantations to tremendous populations of Ips. Infestations from one to fifteen acres were scattered across the Forest by mid-summer. As the amount of rain increased from summer to fall, the Ips populations declined.

Routine observation and surveillance have not identified any insects that are currently at outbreak levels.

Decay is most often associated with fire, mechanical injury, storm damage and old growth. The extensive damage caused by Hugo is expected to create decay in the future. Decay is a long process, starting as stain subsequently producing unsound wood. It often takes 20 to 30 years for decay to become a serious problem.

Fusiform rust infections within the first 10 years of pine regeneration can cause extensive mortality.

The Forest is in a low-hazard rust area. The disease can be managed by using resistant seedlings in reforestation and by removing infested trees during thinnings. Annosus root rot can be a problem in thinning pine stands on deep sandy soils. The disease will require special monitoring in areas not totally salvaged during Hugo. The disease is not a major problem at this time.

Environmental Consequences

Effects of Alternative

Insects and diseases are like other living things in that they require specific conditions to live and increase their populations. The age-classes of specific forest types and the relative abundance of these types are used to indicate those conditions which affect the populations or occurrences of the primary insects and diseases of the Forest.

Implementation of any of the alternatives results in relatively minor differences in the long term age class distributions. Figures III-4, III-5 and III-w6 display the age class distributions for each of the alternatives after the 9th period. The distribution within the loblolly and longleaf pine types results primarily from the application of red-cockaded woodpecker management requirements over the entire forest in alternatives A and D and approximately two-thirds in alternatives B, C and F. There is essentially no difference in the hardwoods or pond pine types since no regeneration harvests are scheduled. Due to extensive breakage caused by Hugo within the hardwood component, decay is expected to increase in all alternatives. Also, the pond pine component may be more susceptible to southern pine beetles under high density conditions. This will lessen over time due to increased levels of hardwood within the pond pine types.

Generally, all alternatives in the long term will have conditions which are favorable for insects and diseases associated with older communities such as pine bark beetles, defoliators, root rot, red heart and other fungi. The primary differences which may occur will be discussed below.

In the short term (the next 30 to 40 years), there will also be relatively little difference between the alternatives age class distributions. Again manipulation of the age class distributions within the pine types Forest-wide will be controlled through requirements for red-cockaded woodpecker habitat. Generally, all alternatives in the short term will have favorable conditions for insects and diseases associated with early to mid-successional pine communities such as pales weevil, pine sawfly, pine tip moths, fusiform rust, annosus root rot and brown spot needle blight. Also the Forest may have extensive areas in the mid-successional pine communities which are especially favorable for pine bark beetle expansion. The primary differences which may occur will be discussed below.

Many factors may influence these general characterizations of the Forest's consideration for insect and disease populations in both the short and long term. Intermediate treatments such as thinnings, release, or salvage operations have direct affects at the site level conditions. For example, although older pine stands are considered to be more conducive to southern pine beetle populations, a relatively young pine stand may be as favorable or more so, if the young stand is stressed form being overstocked, subjected to prolonged drought, or infected by disease. Local weather extremes, natural disturbances, exotic pests and natural insect and disease population cycles all influence insect and disease populations and the conditions of the Forest. For this analysis of effects, it is assumed that the principles of integrated pest management (IPM), such as maintenance of appropriate stocking levels, matching suitable species to appropriate sites, monitoring population levels, etc., will be applied in all alternatives. Specific examples of IPM would be thinning to reduce population increases of southern pine beetle and treating the stumps to retard root rot growth on high hazard sites.

Alternative A estimates that longleaf pine will be the dominant tree species on approximately 63,600 acres. Approximately 64 percent of the pine will be greater than 90 years old with the remaining pine evenly distributed from 1 to 50 years old. Generally, the Forest will in the long term be less favorable to pine bark beetles, fusiform rust and annosus root rot and more favorable to red heart due to increased longleaf acreage. However, pine bark beetle populations may increase in the older loblolly component. In the short term, conditions for brown spot needle blight may increase due to conversions to longleaf. However, this increase should be slight due to the extensive burning program. Conditions favoring annosus root rot should decrease in both the long and short term by converting loblolly pine to longleaf pine on high hazard sites.

Alternative B retains the current forest types throughout the planning horizon. Approximately 38 percent of the pine will be greater than 90 years old with the remaining 62 percent evenly distributed from 1 to 60 years old. The loblolly pine in the older age classes will provide conditions which may increase the level of pine bark beetles. This condition will be greatest in areas managed for RCW. Conditions may also be favorable in the loblolly pine component for pales weevil, fusiform rust, tip moth and the longleaf component to pine sawfly and brown spot because a higher level of regeneration is estimated. This condition will be greatest in areas outside RCW areas.

Alternative C increases the amount of longleaf pine by approximately 9,500 acres to a total of 46,500 by conversion of loblolly pine. The 9,800 acres of mixed types will be converted to bottomland hardwoods. Approximately 48 percent of the pine will be greater than 90 years old while the remaining acreage will be distributed from

1 to 80 years old. The relative effect of the conversions will be minimal; therefore, the effect on insects and diseases should follow the general trends described earlier for older communities. However, conditions for those insects and diseases dependent on older communities will be greater within RCW areas while conditions for those insects and diseases dependent on the early succession communities will be greater in areas outside RCW areas.

Alternative D increases the amount of longleaf pine by approximately 15,400 acres to a total of 52,400 through conversion of loblolly pine. Approximately 42 percent of the pine will be greater than 90 years old and 58 percent distributed from 1 to 60 years at the end of the 9th period. Conditions favorable to pine bark beetles will increase but will be tempered by the younger age classes distributed throughout the Forest as well as an emphasis on retaining higher components of hardwoods within pine stands. Conditions within longleaf pine for brown spot will increase due to increased acreage in regeneration and relatively lower prescribed burning levels.

Alternative F increases the amount of longleaf pine by approximately 16,500 acres to a total of 53,500 through conversion of loblolly pine. Approximately 39 percent of the pine will be greater than 90 years old and 61 percent distributed from 1 to 60 years old. In the areas managed for RCW, conditions conducive to pine bark beetles should decline due to higher levels of longleaf pine while conditions for red heart may increase. Conditions outside RCW areas should be less favorable to pine bark beetles due to increased regeneration levels, conversion to mixed types, or higher levels of hardwood within pine stands while increasing favorable conditions for pales weevil, tip moth and fusiform rust.

Effects of Probable Activities

Constructing developed recreational facilities, constructing trails, constructing roads; reconstructing roads; constructing wildlife openings

Construction activities may cause mechanical injury to roots and stems, soil compaction, drainage pattern changes and winthrow. These disturbances can result in root diseases, main stem decay, bark beetle activity, hazardous trees and reduced tree vigor. Tables III-1a, b and c show a comparison of the estimated amount of these activities by alternative.

Maintaining developed recreational facilities; maintaining trails; maintaining roads; maintaining wildlife openings

Maintaining constructed facilities, trails, wildlife openings and roads provides an opportunity to improve and restore general forest health in these areas. Practices such as removing disease or insect affected trees improves the health of the site and the general forest area. Areas which may serve as population centers for insect buildups are controlled. However, poor practices can result in the problems noted above. Tables III-1a, b and c show the estimated number of facilities and miles of open roads by alternative.

Charging user fees

No effects to insects and diseases will result from this activity.

Closing roads

Road closings may delay the timely detection and suppression of insect or disease outbreaks.

Fewer roads to maintain will reduce root injury and mechanical damage. Tables III-1a, b and c show the estimated miles of closed roads by alternative.

Cross-country motorized vehicle travel

Cross-country motorized vehicle travel can result in mechanical injury, soil compaction, and drainage pattern changes which could result in increased pest activities and losses from root diseases, decay and bark beetles. Tables III-1a, b and c show a comparison of OHV use by alternative.

Converting pine stands to mixed stands; managing hardwood in pine stands.

Converting pine stands and managing hardwood stands provide an opportunity to employ ecological approaches that can prevent and reduce pest outbreaks. Mixed stands are not as susceptible as pure stands to some pests. Tables III-1a, b and c show the amount of conversion and hardwood management comparison by alternative.

Converting loblolly pine to longleaf pine

Longleaf stands are less susceptible to fusiform rust, a major stem canker disease of southern pines. Brown spot, a disease of longleaf seedlings may require control with prescribed burning. Longleaf pine stands are less susceptible to southern pine beetle in the coastal plains. Genetically improved seedlings provide an opportunity to improve the health and vigor in planted stands. Tables III-1a, b and c show the estimated amount of conversion by alternative.

Harvesting trees; timber stand improvement

Timber harvesting and timber stand improvement provides an opportunity to implement an ecological approach to prevent or reduce serious pest outbreaks. Harvesting trees provides an opportunity to remove diseased and high risk trees. However, harvest can cause mechanical injuries which could result in root diseases, decay and possibly some bark beetle activity. Many serious forest pest problems are the result of forest pests responding to unnatural or altered ecological conditions. Examples are off-site planting, harvest schedules beyond the entomological or pathological rotation of the species, planting susceptible species in known high hazard areas, high stand densities, extensive monocultures, and failure to remove infested or infected overstory trees at harvest. Harvesting trees and timber stand improvement work can maintain the vigor of the forest and play a major role in achieving a healthy forest. Activity-related mechanical injury and soil compaction can result in insect and disease outbreaks such as root diseases, decay, and bark beetles. Tables III-1a, b and c show the estimated amount of these activities by alternative.

Establishing regeneration

On regenerated sites, opportunities for long-term protection, prevention, and restoration of forest health can be planned. Specific management practices that can be used are artificial methods such as genetic selection and fusiform rust resistant stock. Natural methods include controlling stocking densities and matching species to the site. Tables III-1a, b and c show the estimated acres of regeneration by alternative.

Prescribed burning

Prescribed burning offers an opportunity to restore many forest ecosystems to their healthy, original and productive condition. Prescribed fire can be used to suppress diseases such as brown spot in longleaf pine seedlings and to sanitize severely insect-infested stands, such as pile-and-burning of bark beetle infested trees. Prescribed burns with spotty, heavy fuel loads can make stands susceptible to diseases and bark beetle activity. Hot summer ecological burns can cause pest activity such as bark beetle outbreaks. Tables III-1a, b and c show the estimated amount of prescribed burning by alternative.

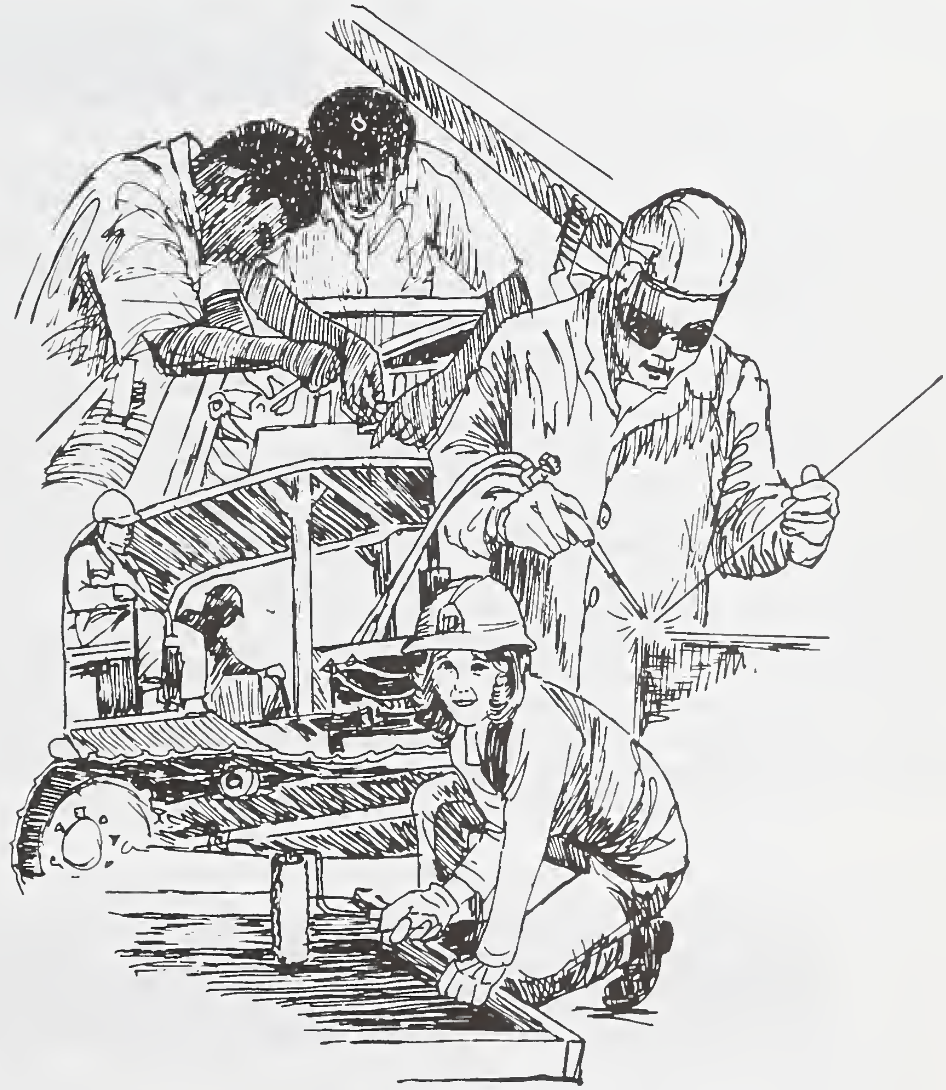
Applying herbicides

Herbicides can be used to manage vegetation and control forest stand conditions that are conducive to insect and disease outbreaks. Tables III-1a, b and c show the relative herbicide use by alternative.

Managing transitions and inclusions

These activities are limited in scope; therefore, the potential for insect and disease activity should be insignificant. Tables III-1a, b and c show the relative transition an inclusion management by alternative.

Economical/Social Environment



Communities, Groups and Life-Styles

Current Condition

Several communities are located within or adjacent to the Forest: Alvin, Bethera, Buck Hall, Cainhoy, Charity Church, Collins Creek, Cordesville, Doe Hall, Germantown, Green Bay, Honey Hill, Huger, Macedonia, Moore's Landing, Ocean Grove, Old Cordesville, Santee Circle, Sewee, Shulerville and Wando.

There are nine incorporated towns within or next to the Forest: Awendaw, Bonneau, Jamestown, Georgetown, McClellanville, Mount Pleasant, Moncks Corner, Charleston and St. Stephen.

Between 1980 and 1990, the two county area of South Carolina experienced a substantial population growth. Table III-5 shows these changes. Berkeley county experienced the highest rate of population increase because of the desire to work in the Charleston area and live in outlying communities. Improvements in the state's transportation system and shortened commute time have made this growth possible.

Table III-5. Population changes by county (SC Budget and Control Board, 1992).			
County	1980	1990	% Change
Berkeley	94,745	128,776	35.9
Charleston	276,556	295,039	6.7
Total	**371,301**	**423,815**	**14.1**

Black residents make up 24 percent of Berkeley county's population and 35 percent of Charleston county's population. American Indian, Asian, Spanish origin and others make up 5 percent of Berkeley and 3 percent of Charleston county's population. Female residents comprise 49.5 percent of Berkeley county's and 50.3 percent of Charleston county's population (S.C. Budget and Control Board, 1992).

The only federally-recognized native American tribe in South Carolina is the Catawba tribe who attained recognition in 1993. This tribe is located primarily in the York county area, and Forest management on the Francis Marion will have no effect on this tribe. There are some groups in the lowcountry area which consider themselves part of a native American tribe, but have no formal organization or current standing.

Social and economic forces are altering the pattern of living in the small communities. First, many people are commuting to the four main employment markets in the area: Charleston, Mt. Pleasant, Georgetown and Moncks Corner. Consequently, they are not economically dependent on the community. By working in urbanized areas, they are exposed to the culture and values of the urban community. Second, communities on the periphery of the national forest are experiencing an influx of new residents from the Charleston area. These new residents are part of an urban culture which differs from the rural culture.

About 32 percent of Berkeley county residents and 82 percent of Charleston county residents work in the county of residence (S.C. Budget and Control Board, 1992). Consequently, a more urban population is now using the Forest. Table III-6 shows the population classified as rural or urban in the two counties over the last 20 years.

The per capital average income (1989) in Berkeley county was $11,244 and $12,775 in Charleston county compared with a state average of $13,624. In 1990, the unemployment rate was 3.3 percent for Berkeley county and 3.5 percent in Charleston county compared to a state average of 4.7 percent.

Table III-6. Population of Counties by Urban and Rural Residences: 1970, 1980, 1990. (SC Budget & Control Board, 1992)						
County	1970		1980		1990	
	Rural	Urban	Rural	Urban	Rural	Urban
Berkeley	54%	46%	41%	59%	35%	65%
Charleston	19%	81%	13%	87%	12%	88%

Environmental Consequences

Effects by Alternative

Forest Plan decisions such as land acquisitions, change in traditional access or uses of the Forest, the change in the number of people coming into or leaving a community and the change in jobs and income indicate .the effects on communities, groups and life-styles. A discussion of the effects of changes in jobs and income is found under the heading of Economy.

In all alternatives, the Forest Service will continue to acquire land through exchange, donation or purchase. The total acreage is expected to be similar in all alternatives. Land acquired by the Forest Service and taken out of private ownership allows opportunities for public use, but makes it more difficult for communities to grow and for residents to acquire land for homes, farms and businesses.

In the long term, alternative A will decrease the jobs and income compared to current management and close the most miles of Forest roads. These probable activities may cause a change in life-styles over the long term in the communities within and surrounding the Forest. There will be less dependency on the Forest as a source of direct income and some traditional uses may be limited due to fewer open roads and management area allocations such as additional acres in wilderness. Timber–related jobs are expected to decrease in the long term. User expectations will change from developed to primitive or semi-primitive conditions. Total recreational visits are expected to remain similar to that under current direction.

Alternative B emphasizes a moderate increase in developed and dispersed recreational services and production of revenues for the local economy. Roadless areas are recommended for additional wilderness, and user fees are encouraged for developed and dispersed activities. In the long term, this alternative has the highest level of timber-related jobs, the largest increase in jobs and income and has the fewest miles of closed roads than any other alternative. Recreational visits are expected to be higher than alternatives A and C, but slightly less than alternatives D and F. Traditional public uses should continue; however, charging more user fees may affect people in the lower income levels more than others. More social contact between users than current is expected due to the additional miles of open roads, additional facilities and increases in visitors.

Alternative C continues the direction of the 1985 Forest Plan as amended. No new recreational facilities or trails would be constructed. Roadless areas are not recommended for wilderness and road closure will continue at current levels. In the long term, this alternative will have the second lowest level of timber-related jobs and the second lowest increase in jobs and income of the alternatives. Traditional public uses and user expectations should continue at similar levels as present.

Alternative D emphasizes a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive recreational opportunities. Roadless areas are not recommended for wilderness, but a management area emphasizing low human disturbance and semi-primitive recreational opportunities is established which connects some existing wilderness. This alternative has the second highest level of recreational facility capacity and the second highest level of recreational visits. In the long term, this alternative produces the second highest timber-related jobs level and the second highest increase in jobs and income. User fees are emphasized in this alternative which may affect lower income people more than others. Some traditional use opportunities will be reduced in the management areas connecting the wilderness and other opportunities not currently available will be found in these areas. More social contact is expected between visitors due to the addition of recreational facilities and opportunities.

Alternative F emphasizes a high level of recreational services, expanding the longleaf pine ecosystem, promoting mast-producing hardwoods and establishing areas for semi-primitive recreational opportunities. Roadless areas are not recommended for wilderness, but a management area emphasizing low human disturbance and semi-primitive recreational opportunities is established which connects the existing wilderness. This alternative has the highest level of recreational facility capacity and the highest level of recreational visits. In the long term, this alternative produces the third highest timber-related jobs level and the third highest increase in jobs and income. Some traditional use opportunities will be reduced in the management areas connecting the wilderness. Semi-primitive recreational opportunities not currently available will be found in these areas. A high level of social contact is expected between visitors due to the addition of recreational facilities.

Economy

Current Condition

Economic information on four contiguous counties, Berkeley, Charleston, Dorchester and Georgetown, was analyzed to develop a perspective of the local economy. The total income in the four county area was $7 billion in 1989, and employment was 240,000 jobs in 1990. The Charleston metropolitan area lies to the southwest of the Forest in Charleston, Berkeley and Dorchester counties. Over 500,000 people currently reside in this metro area, and the population has been growing at the rate of 2 percent per year. Access to the Forest is less than 1/2 hour via highway 17 or the Mark Clark Expressway. Consequently, the Forest is rapidly becoming the "backyard" for many residents.

Economic diversity relates to the number of sectors in a study area, and the distribution of activity within these sectors. The study area economy is relatively diverse for an area of this size with 223 of the 528 sectors that exist in the national economy. One perspective of the area's diversity is reflected in the distribution of employment by major sector show in Figure III-13. This degree of diversity should help the local economy maintain long run stability and provide a base for future growth. The Charleston Navy Base and Shipyard comprise most of the government industry sector. The recent decision to close this facility will have a severe effect on the local economy and economic diversity and dependency.

The wood and paper component of manufacturing is important in the area and is presented separately to reflect its importance. Other forest resource management activities affect the economy; however, they are not as identifiable. For example, tourism-related sectors (eating and drinking, hotels and motels, entertainment, etc.) are influenced by the visual quality of the forest landscape at least indirectly. But the economic activity in these sectors cannot be directly or totally attributed to the visual quality of the forest landscape.

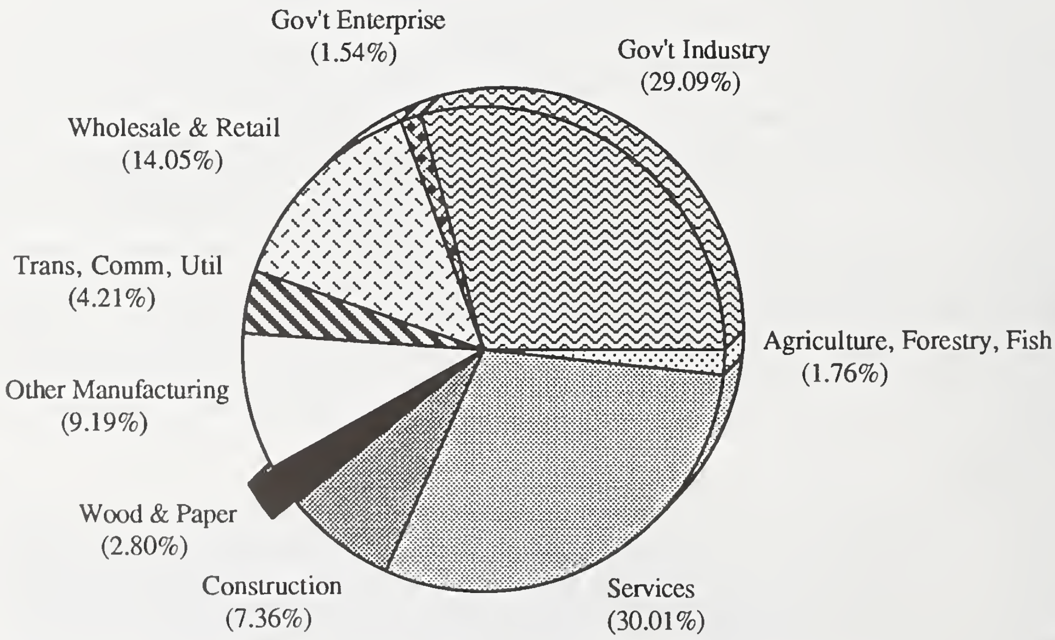


Figure III-13. Economic diversity--employment for Berkeley, Charleston, Dorchester and Georgetown counties.

Economic dependency is a measure of an economy's dependence on specific sectors. One of the forest-related sectors the local economy is somewhat dependent on is the wood and paper manufacturing sector. This sector contributed 5.7 percent of the total income and 4.4 percent of the total employment associated with the local economy's export base. A more detailed explanation of economic diversity and dependency is found in Appendix B.

The Forest interacts with the local economy through Forest Service collections, 25 percent payments to counties and Forest budget expenditures. Table III-7 shows the collections on the Forest over the past nine years. The largest portion of collection has historically come from timber sale and wildlife management area fees.

Table III-7. Total collections on the Francis Marion National Forest from regular timber sales, salvage sales, wildlife management area fees, recreation fees and other uses (land use, minerals) rounded to the nearest thousand.

FY	Regular Timber Sales	Salvage Sales	WMA Fees*	Recreation Fees	Other	Total
84	5,121,000	0	30,000	6,000	22,000	5,179,000
85	5,413,000	0	30,000	6,000	12,000	5,461,000
86	4,879,000	0	30,000	7,000	17,000	4,953,000
87	4,956,000	0	30,000	7,000	17,000	5,010,000
88	2,676,000	19,000	30,000	7,000	22,000	2,759,000
89	2,923,000	36,000	30,000	8,000	19,000	3,016,000
90	4,732,000	3,948,000	30,000	0	14,000	8,724,000
91	162,000	44,000	30,000	0	20,000	256,000
92	101,000	24,000	30,000	1,000	26,000	182,000

*These fees are not used in calculation of 25% fund to counties when fees are collected by the SCWMRD and deposited to the Forest. Figures are approximate annual averages.

Counties in which National Forest Land is located receive 25 percent of the revenue from land based activities such as the sale of timber, fees from campgrounds and royalties from mineral leasing on Federal lands. Most revenues come from the sale of timber. Table III-8 lists the county payments for FY 1980 to 1991. To put the figures in perspective, the expenditures in 1989 for Berkeley County were approximately $33,464,000 and approximately $112,895,000 for Charleston county (SC State Budget and Control Board, 1992).

Table III-8. Payments to counties rounded to nearest thousand $ for FYs 1980–1991

Year	Berkeley ($)	Charleston ($)
1980	539,000	166,000
1981	613,000	189,000
1982	1,126,000	347,000
1983	980,000	302,000
1984	984,000	303,000
1985	1,038,000	320,000
1986	937,000	289,000
1987	952,000	293,000
1988*	520,000	161,000
1989	570,000	177,000
1990**	1,657,000	515,000
1991	43,000	13,000
1992	29,000	9,000

*Payment method changed from deposited basis to timber cut basis.

**Increase due to Hugo timber salvage sales.

Economy

Current Condition

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The wood and paper component of manufacturing is important in the area and is presented separately to reflect its importance. Other forest resource management activities affect the economy; however, they are not as identifiable. For example, tourism-related sectors (eating and drinking, hotels and motels, entertainment, etc.) are influenced by the visual quality of the forest landscape at least indirectly. But the economic activity in these sectors cannot be directly or totally attributed to the visual quality of the forest landscape.

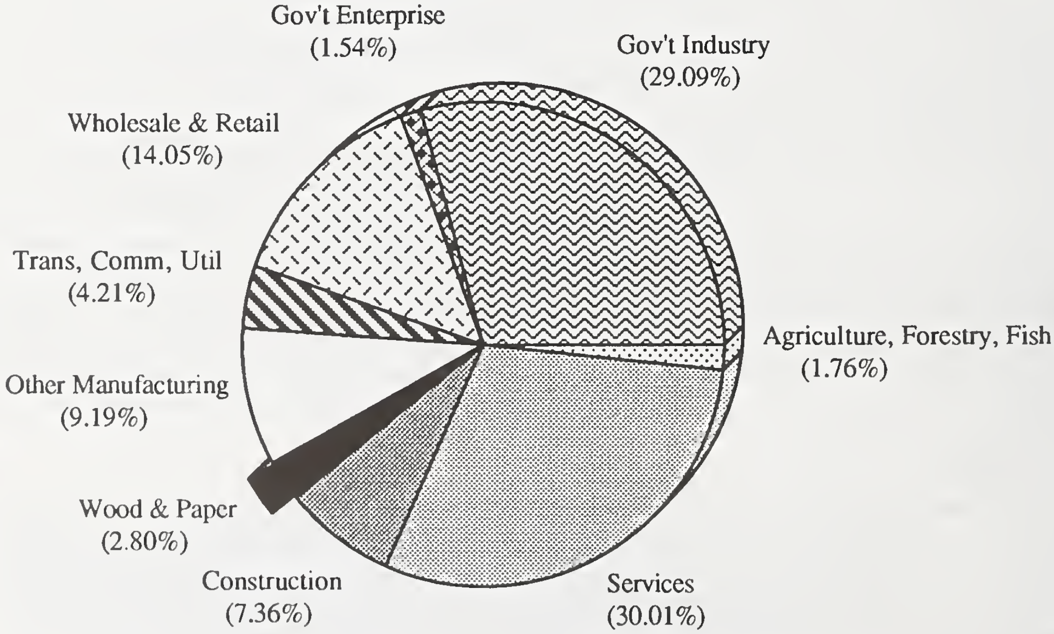


Figure III-13. Economic diversity--employment for Berkeley, Charleston, Dorchester and Georgetown counties.

Economic dependency is a measure of an economy's dependence on specific sectors. One of the forest-related sectors the local economy is somewhat dependent on is the wood and paper manufacturing sector. This sector contributed 5.7 percent of the total income and 4.4 percent of the total employment associated with the local economy's export base. A more detailed explanation of economic diversity and dependency is found in Appendix B.

The Forest interacts with the local economy through Forest Service collections, 25 percent payments to counties and Forest budget expenditures. Table III-7 shows the collections on the Forest over the past nine years. The largest portion of collection has historically come from timber sale and wildlife management area fees.

Table III-7. Total collections on the Francis Marion National Forest from regular timber sales, salvage sales, wildlife management area fees, recreation fees and other uses (land use, minerals) rounded to the nearest thousand.

FY	Regular Timber Sales	Salvage Sales	WMA Fees*	Recreation Fees	Other	Total
84	5,121,000	0	30,000	6,000	22,000	5,179,000
85	5,413,000	0	30,000	6,000	12,000	5,461,000
86	4,879,000	0	30,000	7,000	17,000	4,953,000
87	4,956,000	0	30,000	7,000	17,000	5,010,000
88	2,676,000	19,000	30,000	7,000	22,000	2,759,000
89	2,923,000	36,000	30,000	8,000	19,000	3,016,000
90	4,732,000	3,948,000	30,000	0	14,000	8,724,000
91	162,000	44,000	30,000	0	20,000	256,000
92	101,000	24,000	30,000	1,000	26,000	182,000

*These fees are not used in calculation of 25% fund to counties when fees are collected by the SCWMRD and deposited to the Forest. Figures are approximate annual averages.

Counties in which National Forest Land is located receive 25 percent of the revenue from land based activities such as the sale of timber, fees from campgrounds and royalties from mineral leasing on Federal lands. Most revenues come from the sale of timber. Table III-8 lists the county payments for FY 1980 to 1991. To put the figures in perspective, the expenditures in 1989 for Berkeley County were approximately $33,464,000 and approximately $112,895,000 for Charleston county (SC State Budget and Control Board, 1992).

Table III-8. Payments to counties rounded to nearest thousand $ for FYs 1980–1991

Year	Berkeley ($)	Charleston ($)
1980	539,000	166,000
1981	613,000	189,000
1982	1,126,000	347,000
1983	980,000	302,000
1984	984,000	303,000
1985	1,038,000	320,000
1986	937,000	289,000
1987	952,000	293,000
1988*	520,000	161,000
1989	570,000	177,000
1990**	1,657,000	515,000
1991	43,000	13,000
1992	29,000	9,000

*Payment method changed from deposited basis to timber cut basis.

**Increase due to Hugo timber salvage sales.

The allocation of funds from the National budget to the Forest Ranger Districts from fiscal year 1982-1992 is displayed in Table III-9 (does not include funding to Supervisor's Office).

Table III-9.	Budget rounded to nearest thousand $ to the Forest for FYs 1982—1992.
Year	Amount
1982	$1,532,000
1983	$1,527,000
1984	$1,557,000
1985	$1,541,000
1986	$1,503,000
1987	$1,750,000
1988	$1,716,000
1989	$1,901,000
1990	$5,490,000*
1991	$5,350,000*
1992	$3,634,000*
*Includes Hugo recovery funding.	

Effects by Alternative

The economic effect of Forest management decisions is assessed by the estimated increase or decrease in jobs and income, the estimated return to the counties, the estimated Forest budget and the relationship of these Forest variables to the general economy of the area. Tables III-10, III-11, III-12 and III-13 show comparisons of these variables for the alternatives. Response coefficients by activity for jobs and income were developed for use in a computer model (IMPLAN) to estimate the impacts on jobs and revenues of the alternatives. (See Appendix B.)

The change in jobs and income associated with the alternatives should have little effect on the economic diversity or dependency of the four-county area. The employment and income provided by National Forest management is a small percentage of the four-county total economy (0.2 percent). With the closure of the Charleston Navy base and Shipyard, the importance of the contribution of National Forest management to the economy is not yet known.

In the wood and paper manufacturing sector of the four county area, the National Forest provides about 3 percent of the income and 6 percent of the jobs. The variation in returns to Berkeley and Charleston counties by alternative may have the biggest direct effect on the local community in terms of dollars available for roads and schools.

The alternatives vary little in the jobs and income produced the first period. Most of the jobs and income are tied to the timber management program. The timber production varies little by alternative due to the current condition of the Forest and the red-cockaded woodpecker management requirements. The alternatives have a broader variation in future periods as the Forest recovers and more timber products become available; however red-cockaded woodpecker management requirements limit the range of the variation.

The present net value (PNV) of the alternatives was estimated using discounted costs and benefits over a 90-year planning period. Due to the high costs of construction of the Sewee Visitor Center, recovery of the red-cockaded woodpecker and the low level of timber receipts in the first few periods, the cumulative PNV is negative in all alternatives. In most alternatives, revenue begins to exceed costs in the fourth period as more sawtimber volume becomes available. The PNV by alternative and further discussion are found in Appendix B, Table B-15.

Alternative A will decrease the jobs and income produced from current in the short term and the long term. This alternative also would have the lowest level of funding to the counties and the lowest budget in the short term

and long term.

Alternative B will slightly increase the jobs and income produced from current in the short term. In the long term, this alternative will produce the greatest increase in jobs and income. This alternative produces the highest level of funding to the counties in the long term, but not in the short term. Alternatives B and F have the largest budgets in the short term; however, in the long term, alternative B has the second highest budget.

Alternative C, representing current management, produces a gradual increase in jobs and income as the Forest recovers from the effects of Hugo. In the long term, this alternative will produce the second lowest level of jobs and income. This is primarily due to the long rotation ages for loblolly pine prescribed in the interim red-cockaded woodpecker guidelines. This alternative provides the highest return to the counties in the short term but is the second lowest in the long term. The budget is the second lowest in this alternative in the short and long terms.

Alternative D would gradually reduce the jobs and income from current in the short term, but there would be an increase of jobs and income in the long term. This alternative produces the second lowest jobs and income in the short term, but the second highest jobs and income in the long term. This alternative produces the second lowest return to the counties in the short term, but the second highest in the long term. The budget is the second highest in the short term and the highest in the long term.

Alternative F produces very similar job and income levels as what would occur under current management in the short term, but a higher level than current in the long term. Alternative F produces the third highest return to the counties in the short and long terms. This alternative has the same budget level as alternative B, the highest, in the short term. The budget level is the third highest in the long term.

Effects of Probable Activities

Table III-10. Estimated average annual employment in jobs produced from Forest Service activities by period in the four county area.

	Alternative				
	A	B	C	D	F
Period 1	228	299	287	283	297
Period 5	367	772	554	636	570
Long-term	461	753	519	639	591

Table III-11. Estimated average annual income in millions $ produced from Forest Service activities by period in the four county area.

	Alternative				
	A	B	C	D	F
Period 1	5.6	7.3	7.0	6.9	7.3
Period 5	8.6	18.1	13.0	14.9	13.4
Long-term	10.8	17.7	12.3	15.0	13.9

Table III-12. Estimated average annual 25% fund to counties by alternative in thousand $.

	Alternative				
Period	A	B	C	D	F
1	16	128	169	32	87
2	60	194	146	97	125
3	362	1,120	907	590	636
5	1,096	2,742	1,805	2,101	1,787
9	1,431	2,542	1,551	2,054	1,842

Table III-13. Estimated average annual budget for each alternative in million $.

	Alternative				
Period	A	B	C	D	F
1	4.8	6.7	6.1	6.6	6.7
2	3.6	4.6	4.3	4.4	4.5
3	4.0	6.0	5.4	5.0	5.0
5	4.2	7.6	6.4	6.9	6.3
9	5.7	7.0	6.3	7.2	6.8

Effects of Probable Activities

Constructing developed recreational facilities; maintaining developed recreational facilities; constructing trails; maintaining trails

Construction and reconstruction activities will provide a short term increase in jobs, income, and costs to the government. More recreational facilities and trails will increase visitation on the Forest which will produce more related job opportunities and returns to the government and local community. More recreational facilities and trails will also increase costs to the government because of administration and law enforcement.

These effects vary by alternative based on the number, type and capacity of the facilities and trails constructed. Tables III-1a, b and c show the estimated recreational facilities planned and capacity by alternative.

The more maintenance activities, the more job opportunities, the higher costs and the more return to the local economy. The greater the number and capacity of the facility, the more maintenance would be required. The type of facility would also affect maintenance needed. Campgrounds, picnic areas, rifle ranges, horse trail camps, hunt camps and the visitor center would require more maintenance than boat ramps, canoe access points, swimming sites rails. The level of maintenance will affect the jobs and returns related to maintenance activities and will also affect the visitation to the facilities. Poorly maintained facilities will decrease visitation and subsequent job opportunities and returns to the local community.

The level of maintenance for recreational facilities and trails is common to all alternatives. The estimated number of recreational facilities by alternative, the recreational facility capacity, and the miles of trail by alternative are shown in Tables III-1a, b and c.

Charging user fees

The effects of this activity are related to the amount charged and the degree it is applied on the Forest. User fees will produce returns to the government and local community. If the fees are at a level which would reduce visits or exclude some uses, the effects could be negative on the economy. There are costs associated with collecting and enforcing user fees, and some jobs and income may be created to support this activity. Costs of collecting and administering fees may exceed returns. Alternatives B and D encourage the applying user fees wherever possible.

Constructing roads; reconstructing roads; maintaining roads; closing roads.

A direct effect of constructing or reconstructing roads is creating jobs, income and costs related to construction activities. The magnitude of these effects are determined by the miles of roads constructed or reconstructed and the development level of the roads. Miles of roads reconstructed by alternative is found in Tables III-1a, b and c.

An effect of maintaining roads is creating jobs, income and costs. These effects vary by the miles of open roads maintained and the level of maintenance required. An indirect effect of maintaining roads is on Forest visitation and associated economic effects. If roads are not well maintained, visitation will be reduced, and subsequent job opportunities and returns will be reduced.

Roads will have a constant level of maintenance in all alternatives. The estimated miles of open roads by alternative are shown in Tables III-1a, b and c.

The major effect of closing roads will be to reduce the amount of maintenance required which will reduce the job opportunities and local economy returns. Some of these effects are dependent on the location of the roads closed. The Forest Plan does not make the site-specific determination for road closure, and these effects will be considered at the project level.

The estimated miles of closed roads by alternative are found in Tables III-1a, b and c.

Cross-country motorized vehicle travel

The effects of this activity are related to the amount of cross-country vehicle travel allowed and the number of Forest visitors related to this activity. Fewer restrictions on cross-country motorized travel may result in more visitors engaged in this activity, resulting in more related job opportunities and income to the local community. This use may also conflict with other uses, and overall Forest visitation may decline. Costs to the government for law enforcement, administration and mitigation of negative effects would increase as this activity increased.

A comparison of the restrictions on off–trail motorized vehicle use by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

An effect of constructing and maintaining wildlife openings is an increase in jobs, income and costs related to the construction and maintenance activities. Another effect is the change in Forest use and visitation due to this activity. More openings will increase the population of some wildlife species which could lead to more hunting or wildlife viewing activities and related jobs.

The magnitude of the effect is related to the acres of wildlife openings constructed and maintained. Tables III-1a, b and c show the estimated acres of wildlife openings maintained and constructed by alternative.

Converting pine stands to mixed stands

This activity will affect the future timber volume offered for sale and subsequent jobs, incomes and returns. Stands converted from pine to mixed pine/hardwood would have a lower pine timber yield and related jobs, income and returns would be lower. Habitat may be improved for some species and hunting and wildlife viewing use could increase which would increase related jobs and revenues. The acres converted to mixed stands will determine the magnitude of these effects.

Tables III-1a, b and c show the estimated conversion to mixed stands by alternative. Alternative F is the only alternative to convert pine stands to mixed pine/hardwood.

Converting loblolly pine to longleaf pine.

The effects of this activity are related to the method of conversion and the change in species composition. The effects of the method of conversion are discussed later under harvesting, prescribed burning, establishing regeneration and intermediate timber treatments. Actions associated with longleaf management are longer rotations. In the long term, fewer acres will be harvested and regenerated in the longleaf type than in the loblolly. Fewer harvest acres may result in fewer timber- related jobs, less income and returns. The difference in these effects would depend on the acres converted, the difference in rotation ages of loblolly and longleaf and the product values.

The estimated acres of loblolly converted to longleaf by alternative are shown in Tables III-1a, b and c.

Harvesting trees

Tree harvesting creates job opportunities, income, and costs. These effects are directly related to the amount of timber harvested, the type of product harvested and the method of harvest. More timber harvested will result in more jobs, income, costs and returns. More sawtimber volume harvested results in more returns to the government and local communities. The method of harvest will affect the costs, the sale value and returns to the government and local community. Thinning harvests generally are more costly, have lower sale value and low returns per volume harvested. Generally, higher returns come from regeneration harvests. Regeneration harvests such as seed tree, shelterwood, group selection and single tree selection are usually more costly to prepare and administer per volume harvested than clearcut regeneration harvests. The amount of timber harvested depends upon the acres of land suitable for timber production, the system of management (even or uneven-aged), the thinning required and the rotation age.

Table II-14 shows the periodic allowable sale quantity by alternative.

Establishing regeneration

The amount of regeneration affects job opportunities, income, costs and returns. More cost for regeneration will produce more jobs.

The estimated acres of regeneration established by alternative are shown in Tables III-1a, b and c.

Prescribed burning

The amount and timing of burning done affects job opportunities, income and costs. More acres burned produce more job opportunities for support services needed (equipment, supplies). Another effect of prescribed burning is a reduction in the risk of wildfires and subsequent economic losses. Prescribed burning in the growing season will require more personnel and equipment resulting in higher cost than winter burning.

The estimated acres of prescribed burning by season by alternative are shown in Tables III-1a, b and c.

Applying herbicides; timber stand improvement.

The acres and methods of these treatments affect job opportunities, income, costs and returns. More acres treated results in more costs, subsequent job opportunities and income. The amount and method of these treatments affect the survival and growth of trees. This affects the long-term yield of timber products, other commodities and uses dependent on trees which in turn affects future jobs, income, returns and costs. The probability of these treatments is related to the acres of regeneration established and the intensity of timber management.

The estimated acres of regeneration established by alternative, the estimated acres of timber stand improvement treatments and a relative ranking of herbicide use by alternative are found in Tables III-1a, b and c.

Managing hardwood in pine stands; managing transitions and inclusions

The most common tool used in these activities is including or excluding fire. More areas excluded from fire results in a larger hardwood component. Costs of excluding these areas from fire will be higher if they are plowed out rather than allowing the fire to burn out. Herbicide and manual methods may be used to control species composition. More hardwood in pine stands reduces the yield and returns from pine timber. See Tables III-1a, b and c for a comparison of hardwood management by alternative.

Timber

Current Condition

The primary wood products offered for sale are pine poletimber and sawtimber. Table III-14 displays the volume sold from 1980–1992. Volumes sold from 1990–1992 are primarily salvage of trees damaged by Hurricane Hugo. Little hardwood timber has been sold because of low product value and high logging costs.

Hurricane Hugo heavily damaged 80 percent of the pine stands on the Forest. Heavy damage represents areas where the dominant tree canopy was almost completely removed or destroyed. Most of the heavily damaged stands were greater than 40 years old.

Based on samples of large trees taken on-the-ground and from aerial photographs in the zone of greatest wind damage, approximately 43 percent of the bottomland hardwood species was broken, 43 percent uprooted, and 14 percent left standing with minor damage. Large-crowned, shallow-rooted species, such as oaks, were generally uprooted. Species with smaller crowns or more extensive root systems, such as sweetgum, usually broke or suffered some crown damage, leaving them as growing stock and as a source of seed and sprouts. Baldcypress and water tupelo suffered minimal crown damage and little breakage, leaving most of the forested creek and muck swamps intact (Hook, et. al, 1991). Product quality of the hardwood resource was poor before Hugo and has been reduced since.

Table III-14. Timber volumes sold on the Forest from 1980 to 1992.

Year	Volume MMCF	Year	Volume MMCF
1980	6.91	1987	7.19
1981	7.92	1988	7.89
1982	9.16	1989	7.94
1983	8.89	1990	40.55
1984	8.53	1991	7.87
1985	10.09	1992	5.58
1986	8.95		

Hugo severely reduced the supply of pine wood products on the Forest. The US Forest Service Inventory and Analysis work unit estimates that the Forest's pine inventory of softwood growing stock was reduced 57 percent. This reduction in pine growing stock includes a 66 percent reduction in the pine sawtimber component. The hardwood growing stock inventory was reduced 22 percent with hardwood sawtimber reduced by 27 percent. Follow-up surveys show that the actual losses for the pine component may be greater since trees continue to die.

Hugo drastically reduced the supply of the pine growing stock by 53 percent and hardwood growing stock by 18 percent in the 23 county-wide area affected by the hurricane. Surveys show that the primary effects of the reduced supply are being felt by solid wood products (non-paper) industries. Paper companies have been affected but not to the degree that the solid wood products industries have been.

The demand for wood products in the Forest area is difficult to assess due to the sudden change in supply conditions. Competition for the remaining supply of solid wood has increased dramatically based on increased bid prices and number of bidders. Since 1985, wood product prices have increased in the coastal plain of South Carolina. Pine sawtimber increased 39 percent, mixed hardwood sawtimber increased 70 percent, pine pulpwood increased 65 percent and hardwood pulpwood increased 1200 percent. Industries that depended heavily on timber from the Forest have increased the distances that they must travel to buy wood. Most companies in the 23 county damage area have expanded their procurement operations into other parts of South Carolina, Georgia, and North Carolina. Therefore, the true impact of Hugo on the wood products industry is not confined to the damage area. Other expected changes in the industry are the type of raw material demanded and the type of product produced. For example, industries that once procured large, high-quality logs have reduced the size and quality standards for logs (Syme, 1992). Paper mills are projecting a substantial increase in consumption of hardwood pulpwood (Syme, 1992). Increased demand is expected for many reasons: many companies expanded plant capacities prior to Hugo; national and regional trends of decreased availability of timber on National Forests; and an overall reduction in timber supply in the region.

Many smaller companies may not have the resources to continue to compete with larger companies for timber in the area (Syme, 1992).

Nationally, the projected demand for both hardwood and softwood is expected to increase. (Forest Resource Report No. 24, 1988) By the year 2030, projected demand for softwood is up 20 percent while hardwood demand is expected to rise 72 percent.

A quantifiable future demand level for wood products on the Forest cannot be made in light of the numerous unknown conditions brought about by Hurricane Hugo. However, short-term demand has increased due to the greatly reduced supply, and long–term demand is expected to increase based on national and regional demand trends.

Environmental Consequences

Effects by Alternative

Designation of lands as suitable for timber production, amount of wood products offered for sale, long term sustained yield capacity, and long term age class distribution of the suitable lands were selected to measure the effects of implementing the alternatives on the timber resource. These four components were selected since they respond to the various vegetation management strategies associated with achieving alternative goals, desired conditions or objectives. The single most influencing factor on the timber resource is the management of red-cockaded woodpecker habitat. Red-cockaded woodpecker habitat management is directed by the Draft RCW Management Handbook. For a more complete discussion of RCW management requirements, see Appendix B.

No harvests have been scheduled in any alternative within the pond pine or hardwood types on suitable or unsuitable lands. These areas were not scheduled due to relatively low product values, high logging costs, and high cost of mitigating measures.

A display of the long–term age class distributions for suitable land for each alternative can be found in Figure III-14.

Alternative A designates all lands as unsuitable for timber production. However, there will be timber harvests associated with plant community restoration or maintenance and RCW management such as conversion of loblolly pine to longleaf, thinning to improve or maintain foraging habitat, and regeneration harvests to provide for future habitat. It is estimated that about 28.3 MMCF will be harvested the 1st period and long term sustained yield capacity of 44.2 MMCF per period by the 8th period. About 64 percent of the pine and essentially all of the mixed, pond pine, and hardwood types will be greater than 90 years old by the end of the 9th period. The remaining 36 percent of the pine will be relatively evenly distributed from age 1 to 50 years old.

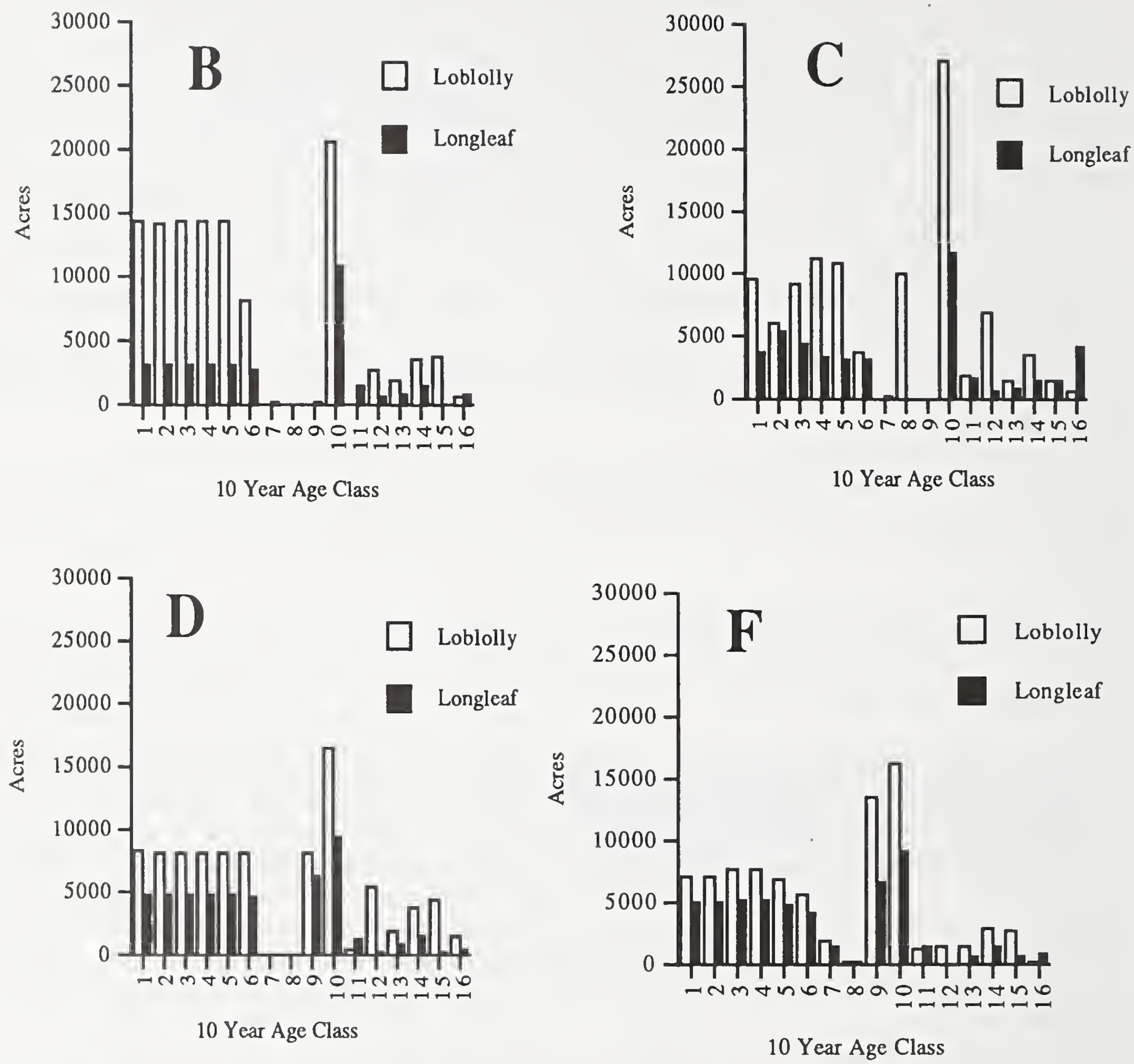


Figure III-14. Long-term age-class distribution for suitable lands with scheduled timber harvest by alternative.

Alternative B designates about 206,000 acres as suitable (83 percent of the Forest) and 44,000 acres as unsuitable. The estimated amount of wood products offered for sale during the 1st period is 30.7 MMCF. The LTSYC is estimated to be 86.7 MMCF and achieved by the 4th period. About 38 percent of the pine types and all of the mixed, pond pine and hardwood types will be greater than 90 years old by the end of the 9th period. The remaining 62 percent of the pine types will be relatively evenly distributed from age 1 to 60 years old.

Alternative C designates about 203,000 acres as suitable (81 percent of the Forest) and 47,000 acres as unsuitable. The estimated amount of wood products offered for sale during the first period is 32.7 MMCF. The LTSYC is estimated to be 58.4 MMCF and achieved by the 4th period. About 48 percent of the pine types and all of the pond pine and hardwood types will be greater than 90 years old by the end of the 9th period. The remaining 52 percent of the pine types will be relatively evenly distributed from age 1 to 80 years old.

Alternative D designates about 193,000 acres as suitable (77 percent of the Forest) and 56,000 acres as unsuitable. The estimated amount of wood products offered for sale during the first period is 28.3 MMCF from suitable lands and about 1.1 MMCF from Unsuitable lands for RCW habitat. The LTSYC is estimated to be 69.1 MMCF and achieved by the 8th period. About 42 percent of the pine types and all of the mixed, pond pine and hardwood types will be greater than 90 years old by the end of the 9th period. The remaining 58 percent of the pine types will be relatively evenly distributed from age 1 to 80 years old.

Alternative F designates about 201,000 acres as suitable (80 percent of the Forest) and 49,000 acres as unsuitable. The estimated amount of wood products offered for sale during the first period is 30.2 MMCF from suitable lands and about 6.8 MMCF from unsuitable lands for RCW habitat. The LTSYC is estimated to be 63.4 MMCF and achieved by the 8th period. About 39 percent of the pine types and all of the pond pine and hardwood types will be greater than 90 years old by the end of the 9th period. The remaining 61 percent of the pine types will be relatively evenly distributed from age 1 to 60 years old. Sixty-six percent of the mixed types will be greater than 90 years old, 29 percent age 40 years or less and the remaining amount distributed from age 41 to 90 years.

Effects of Probable Activities

The effect of probable activities on the Suitable lands, allowable sale quantity (ASQ), and long-term sustainable yield capacity (LTSYC) are discussed below.

Constructing developed recreational facilities; constructing trails; constructing roads; constructing wildlife openings

By allocating lands for specific non-timber purposes, these lands are not classified as suitable for timber production. This indirectly effects the ASQ and LTSYC by reducing the amount of lands which they are based upon. Trails and facilities will decrease timber production on adjacent suitable land. Less intensive practices will occur on land adjacent to facilities and trails due to usual quality concerns. Tables III-1a, b and c show the estimated number of new recreational facilities, the estimated miles of new trails and the estimated acres of new wildlife openings by alternative.

Maintaining developed recreational facilities, Maintaining trails, Charging user fees, Reconstructing roads, Maintaining roads, Maintaining wildlife openings, Cross-country motorized vehicle travel

These activities have no effect on the timber resource.

Closing roads

If roads are closed by some type of barricade, there is no effect on the timber resource. If obliteration and planting trees are the methods used, these lands may be returned to the suitable for timber production designation. This would then expand the land base for the calculation for ASQ and LTSYC. The effect would be minor due to the small acreage involved. See Tables III-1a, b and c for the estimated miles of closed roads by alternative.

Converting pine stands to mixed stands

There is no effect on the suitable land base in converting to mixed stands. Harvesting commercial wood products in regeneration harvests or thinnings contributes to the obtainment of ASQ. Future pine volumes as reflected in LTSYC and ASQ will likely be lower due to conversion to mixed stands. Merchantable loblolly pine volumes may be 1/2 of their 20 year old potential when grown in mixed stands. Reductions in sawtimber volumes may be reduced even further (Langdon and Trousdell, 1974) (Smith and Hafley, 1987). However, long-term studies (greater than 35 years) have not been completed and future reductions may not be as dramatic.

Considering the relatively small percentage of the Forest which may be converted, the Forest-wide changes to ASQ and LTSYC will be insignificant. Tables III-1a, b and c show the estimated acreages of this treatment by alternative.

Converting loblolly pine to longleaf pine

There is no effect on the suitable lands base in converting loblolly pine stands to longleaf pine. Harvesting commercial wood products to accomplish the conversion will contribute to the obtainment of ASQ.

The primary effect of the conversion is associated with difference in rotation ages from loblolly to longleaf. Rotation ages will increase, reducing the area that may be harvested per period.

Lowering available harvest acres by increasing rotation age may reduce short-term ASQ levels. The effect on long-term ASQ and LTSYC levels is uncertain in the absence of long-term growth and yield studies. Since longleaf pine is a longer-lived species than loblolly and more suited to these drier sites, volume per acre at these advanced ages may be greater for longleaf since mortality from insect and disease may be less. Tables III-1a, b and c display the estimated acreages of this treatment.

Harvesting trees

There is no effect on the suitable land base in harvesting commercial wood products from the Forest. Harvesting commercial wood products for regeneration harvests or thinnings is the means to obtaining the ASQ.

Future yields are affected by harvesting trees in thinning operations due to effects on growth of the residual stands. Total yield may not be significantly changed by thinnings. However, the type of wood product and the time needed to reach a certain product size is significantly affected by thinning. Thinning effectively concentrates stand growth to the remaining trees resulting in more vigorous growth and obtainment of desired product size in less time. Thinnings also utilize trees that would otherwise be lost to mortality and decrease the risk of future mortality by enhancing tree vigor. Tables III-1a, b and c show the estimated harvest acres by alternative.

Establishing regeneration; managing hardwood in pine stands; applying herbicides; timber stand improvement; managing transitions and inclusions

There is no effect on the suitable land base through these activities. However, long-term ASQ levels and LTSYC are significantly affected. The effects are dependent on pine stocking and level of hardwood within the pine stands. Generally, the level of hardwood and competing brush or herbaceous species that is allowed in pine stands is controlled at the time of establishment which in turn effects the pine stocking level. Future within stand levels of hardwoods are controlled through use of prescribed burns, thinnings, or herbicide treatments. Tables III-1a, b and c display the relative ranking of the within stand hardwood component of each alternative. Generally, the lower the level of hardwoods allowed within pine stands, the greater the future ASQ and LTSYC levels will be.

Pre-commercial thins are also used to control the density of the pine trees within a stand. The effects on growth and yield are similar to the effects of commercial thins.

Since application of herbicides is a specific method of managing vegetation, it is assumed that if application is not allowed, other methods such as cutting, prescribed burning, or mechanical treatments will be substituted to achieve growth and yield objectives. Tables III-1a, b and c display the relative potential use of herbicides by alternative.

There is no effect on the suitable lands base by managing transitions and inclusions. Effects on short-term ASQ is negligible. The effects on future ASQ and LTSYC are dependent on the level of pine allowed in these areas. See Tables III-1a, b and c for comparison among alternatives in their emphasis of hardwood management.

For further information Tables III-1a, b and c show the estimated acres of type of timber stand improvement by alternative, the estimated acres of regeneration by alternative and the emphasis of hardwood management by alternative.

Prescribed burning

There is no effect on the suitable lands base by prescribed burning. Effects on short-term ASQ is negligible. The effects on future ASQ and LTSYC depend on the level of hardwoods within pine stands. The level of hardwoods within pine stands will be less when growing season burns are used and the time between burns (burning cycles) is decreased. Tables III-1a, b and c display the estimated amount and relative proportion of growing-season burns by alternative.

Minerals

Current Condition

The United States holds title to all minerals beneath the surface of the Forest. There are no active mines on National Forest land at this time. Principle mineral resources on the Forest are limestone, sand, ceramic clays, heavy minerals and gravel. Phosphate minerals are present at shallow depths along the southwest exterior of the Forest. To date, there has been little interest exhibited in developing phosphate minerals beneath the Forest.

The US Geological Survey (Libby-French, 1990) has determined that the potential for oil and gas resources in the Atlantic coastal plain is low. This is caused by a lack of good source rocks for petroleum (layers of highly organic shales).

According to the US Bureau of Mines (White, 1988) the Forest contains abundant limestone. Martin-Marietta Company and the Southern Aggregate Company operate quarries and crushing plants both inside and outside the Forest boundary. There has been no demand to develop similar resources on National Forest land because of the abundant deposits available on private lands. The South Carolina Highway Department has used small sand and gravel deposits on the Forest, and the Forest Service has used sand and gravel for road construction and maintenance.

A 1982 study by the US Geological Survey (Force, et al, 1982) showed the presence of alluvial deposits of heavy minerals (e.g., ilmenite, monazite, rutile, zircon, kyanite) in the beach sands of the Atlantic coastal plain. Similar deposits are being mined in Florida and Georgia. The heavy minerals are found in Pleistocene Age (about 1.6 million years ago) beach complexes located 1 to 30 miles inland. A deposit must contain about 5 percent heavy minerals by volume to be economical to mine.

Kerr-Magee Corporation of Oklahoma City has four prospecting permit applications filed with the Bureau of Land Management (BLM) covering 19,864 acres of the Forest. It is possible that the Forest contains commercial quantities of heavy mineral resources, specifically ilemite and rutile whose titanium content is used as a pigment in paints.

Parts of the Forest are underlain by the phosphatic Cooper Marl. The lack of any phosphate mining in the area shows that the phosphate resources cannot be economically developed under current market conditions. There may be interest in exploration and development in the future.

Radioactive minerals have been detected in the phosphatic Cooper Marl with an average range of 0.025-0.063 percent uranium equivalent. This range was detected in a thin erosional surface. It is unlikely a deposit this small would have any economic value because of the current low price for uranium and much richer more easily accessible areas in other parts of the world.

Environmental Consequences

Effects by Alternative

Mineral exploration and development are permitted in all alternatives; however, management goals, objectives and desired future conditions of the alternatives will influence how much minerals may be extracted.

Unless the market conditions change, there is not likely to be a change in mineral development under any alternative.

Alternative A emphasizes maintaining natural ecosystems with a lower priority given to product outputs. Mineral development will be minimal in this alternative.

Both alternatives B and C emphasize commodity outputs and production of revenues for the local economy. Alternative B has a slightly higher emphasis on revenue production than C. Should market conditions change, there is a high probability of mineral development under these alternatives.

Alternatives D and F emphasize providing a high level of recreational services, expanding the longleaf pine ecosystem and establishing areas for semi-primitive recreational opportunities. The existence of areas of low human disturbance in each of these alternatives will limit mineral development. The emphasis placed on recreational development and semi-primitive recreational opportunities may not be compatible with a high degree of mineral development.

Effects of Probable Activities

Most of the probable forest management activities will not significantly affect the supply or demand for minerals in the area. The presence of PETS species may affect mineral availability the most. Some activities may have a small, localized effect. These activities are discussed below.

Constructing developed recreational facilities; constructing trails; closing roads; constructing roads; reconstructing roads; maintaining roads

These activities may involve use of minerals, and some sand and gravel deposits on the Forest may be utilized. Constructing facilities, trails and roads may prevent possible future mineral extraction on those sites. Closing roads will reduce maintenance needs and subsequent demand for sand and gravel on the Forest. The estimated amount of facility, trail and road construction, road closure and total open roads by alternative is shown in Tables III-1a, b and c.

Recreation

Current Condition

Recreation has become one of the largest industries in South Carolina. In 1990, almost $4.5 billion were spent in recreational pursuits, creating over 88 thousand jobs statewide (SCPRT, 1990).

The Forest is located along the tourist-oriented coast of South Carolina where nearly half of all camping at public facilities occurs (May, 1992).

The Forest offers developed and dispersed recreational opportunities, but most opportunities are dispersed. Only 2 percent of the developed campsites in the Charleston, Berkeley and Dorchester county area are located on the Forest. However, 100 percent of the OHV trails and horse trails and 94 percent of the public hunting in the tri-county area are located on the Forest (May, 1992).

Outdoor recreational trends have changed nationwide in recent years, and these changes have affected the recreational use patterns on the Forest. People are taking more frequent trips or vacations that are shorter and closer to home. There is also a shift toward more risk and adventure oriented activities (May, 1992).

The Charleston metropolitan area lies just southwest of the Forest. Over 500,000 people reside in this area which includes Charleston, Berkeley and Dorchester counties. Populations in this area are growing about 2 percent per year. Access to the Forest is less than 1/2 hour via US Highway 17 or the Mark Clark Expressway. Consequently, the Forest is rapidly becoming the backyard for many residents.

In addition, the Forest lies between Charleston and Myrtle Beach. US Highway 17 has heavy tourist traffic. According to a 1991 report by the South Carolina Department of Parks, Recreation and Tourism, Charleston ranked 21st among all North American centers as a destination with over 300,000 adult city vacationers per year.

After the Sewee Visitor Center is completed, the public will enjoy more opportunities to visit the Forest.

Recreation Opportunity Spectrum (ROS): The Forest has the potential to provide a wide variety of recreational settings. The Recreation Opportunity Spectrum (ROS) has been developed to help quantify and describe these settings. The ROS system portrays the appropriate combination of activities, settings, and experience expectations that range from primitive to urban. Table III-15 shows the current acreage in each ROS class. The six classes and their descriptions are listed on the following page.

Table III-15. Recreation Opportunity Spectrum Acres

ROS Class	Acreage
Primitive	13,549
Semi-primitive Motorized	263
Roaded Natural	144,434
Rural	85,181
Santee Experimental Forest	6,076
Total	**249,503**

Primitive	Area is characterized by essentially unmodified natural environment of a size or location that provides the opportunity for isolation from sights and sounds of people. Motorized use within the area is normally not permitted.
Semi-primitive Non-Motorized	Area is characterized by predominantly unmodified natural environment of a size or location that provides good-to-moderate opportunities for isolation from sights and sounds of people. Motorized use is not normally permitted.
Semi-primitive Motorized	Area is characterized by predominantly unmodified natural environment of a size or location that provides a good-to-moderate opportunity for isolation from sights and sounds of people except for facilities essential for the use of motorized equipment. Motorized use is permitted.
Roaded Natural	Area is characterized by predominantly natural appearing environment with moderate evidence of sights and sounds of people. Conventional motorized use is provided for in construction standards and design of facilities.
Rural	Area is characterized by substantially modified environment. Facilities for intensified use are available.

Developed Recreation: The Forest maintains 14 developed recreational facilities (Recreation Area Map). One additional recreational site is approved for construction and is in the development stages—the Sewee Visitor Center (a joint venture with the U. S. Department of the Interior, Fish and Wildlife Service). This facility will be built adjacent to US Highway 17. Following Hurricane Hugo, Tarpit Picnic Area was permanently closed due to high replacement costs and low use rate. Camping is no longer permitted at Huger Recreation Area.

Historically, most visitors to the Forest were local residents. No developed sites were located near beaches, and most provided only minimal accommodations. Lack of advertising affected visitation. Buck Hall Campground has been recently rebuilt and offers electrical hookups.

Another factor affecting visitation is weather. During the summer months, the weather on the Forest is generally hot and humid. These conditions combined with numerous insects such as mosquitoes reduce the desirability for participation in dispersed and developed activities. With the addition of electrical hookups at Buck Hall, greater visitation is anticipated. Most outdoor recreational use occurs during the fall, winter and spring months. Based on estimates by Forest Service personnel, most of the Forest's recreational sites have an occupancy rate of less than 30 percent.

Trail use on Wambaw Cycle Trail by motorcycles and OHVs remains high, and there is growing interest statewide. The number of horseback riders on the Jericho Horse Trail is generally low, but interest in riding the trail is increasing. The number of hikers using the Swamp Fox hiking trail is increasing, but since the trail does not have any short loops that can be hiked in a few hours, use remains low. Interest in boating and canoeing is also increasing. Mountain biking was not popular on the Forest until the last few years. Interest in riding on the Forest has increased significantly. Picnicking use on the Forest is significant.

Figure III-15 shows the use of recreational activities, and the current capacity of those activities. The

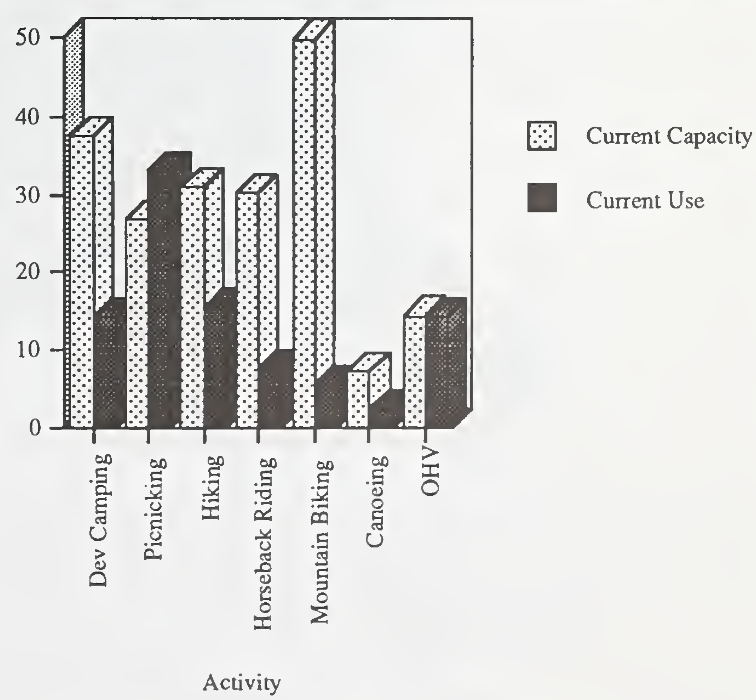
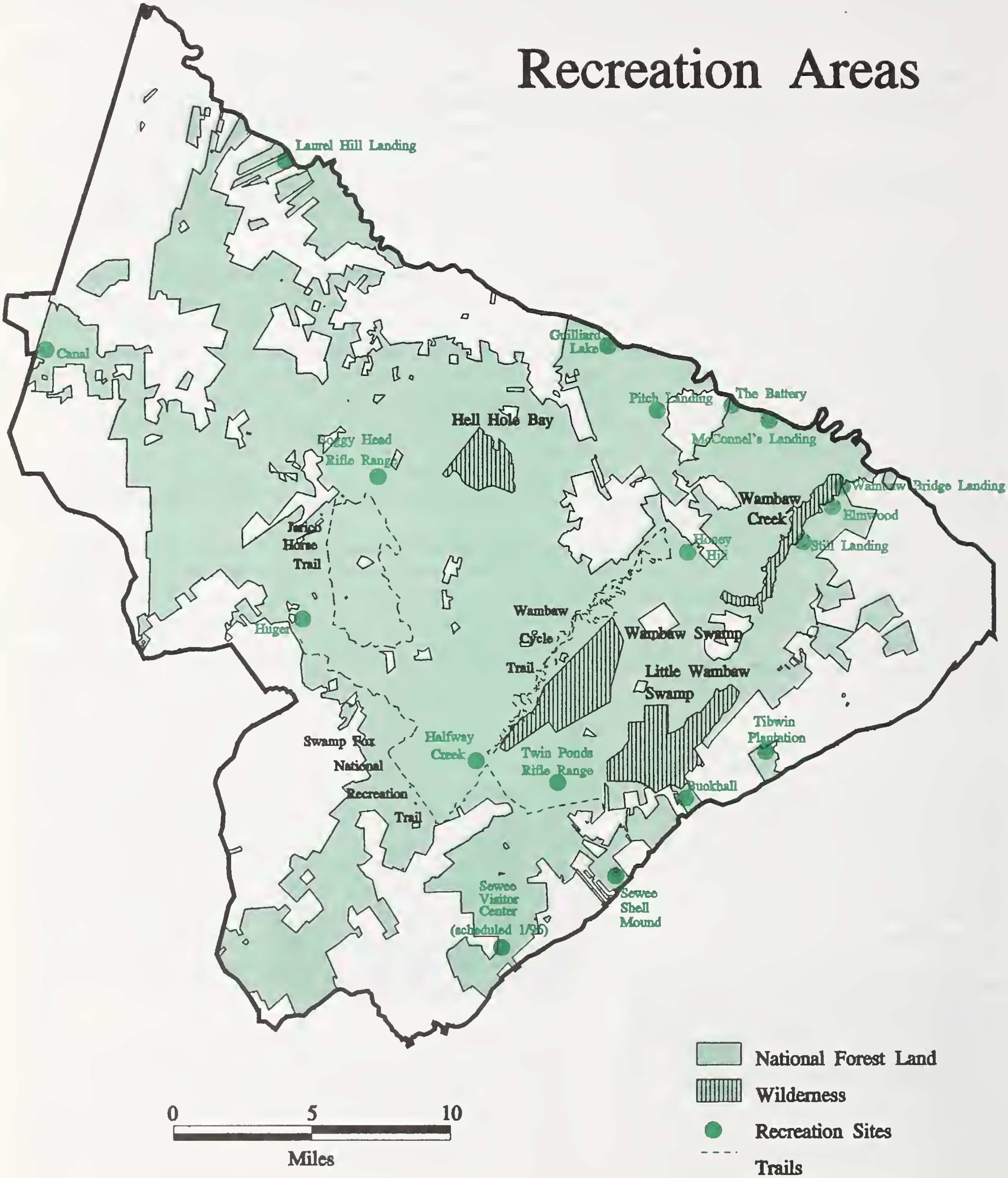


Figure III-15. Current capacity and use of recreational facilities

Recreation Areas



current capacity for picnicking on the Forest does not reflect dispersed picnicking opportunities such as along a river bank or on rock out-croppings, etc. Currently, there are no mountain bike trails, but bikers are allowed on hiking trails, ORV trails, horse trails and roads.

Dispersed Recreation: Camping at locations other than developed camping sites and other designated areas requires a camping permit. The permits are free and issued by the District Rangers.

There are 49.5 miles of non-motorized trails for hiking, horse riding and canoeing (10.5 miles of canoe trails also permit motorized use). There are 40 miles of motorized trails that are designed for motorcycles and all-terrain vehicles that are less than 50 inches wide. The Jericho Horse Trail and the Swamp Fox National Recreation Trail are closed to OHV use. There are 10.5 miles of motorized boat trail (Wambaw Creek Wilderness). There are no trails on the Forest for 4-wheel drive (jeep) type vehicles or trails exclusively for mountain bike use.

All of the trails on the Forest were closed following Hurricane Hugo due to heavy blowdown. The horse trail and portions of the hiking trails were opened with a dozer which lowered the tread of the trail significantly. Due to the high water table, portions of the horse trail are under water. The hiking trail is open except for some sections where the trail is under water or muddy year long. The canoe trail in the Hellhole Bay Wilderness has been re-opened. The Wambaw Creek Wilderness canoe trail is in very good shape. None of the trails are closed during hunting seasons.

The use of OHVs in the general forest has been controversial since the 1985 Land Management Plan was approved. Based on the written direction in the Plan, it is difficult for Forest personnel and the public to know where OHV use is allowed, restricted or prohibited.

The OHV policy as stated in the 1985 Francis Marion Land and Resource Management Plan is:

> The Forest will generally be open to OHVs. In areas of obvious conflict with other uses and in areas where natural resource damage may result from OHV use, the areas will be closed to such use.
> The following areas are currently closed to OHV use:
>
> (1) Developed recreational sites (except for ingress and egress of parking facilities);
> (2) Wildlife clearings;
> (3) Rights-of-way for electrical transmission lines, pipelines or telephone lines;
> (4) Watercourses (creeks, streams, etc.) except to cross perpendicularly;
> (5) Timber regeneration areas, where trees are less than 10 feet high;
> (6) Wambaw Swamp Wilderness;
> (7) Little Wambaw Swamp Wilderness;
> (8) Wambaw Creek Wilderness;
> (9) Hellhole Bay Wilderness;
> (10) Seewee Indian Shell Mound Archeological Area;
> (11) Santee Experimental Forest;
> (12) Francis Marion Seed Orchard;
> (13) The Battery;
> (14) Watahan Plantation;
> (15) Guilliard Lake Scenic Area;
> (16) Guilliard Lake Research Natural Area;
> (17) Cemeteries; and
> (18) Cultural resource sites.
>
> During hunting seasons, vehicles will be permitted only on opened roads and designated trails.

In addition, Plan direction is in conflict with Section 6.2 of the South Carolina Wildlife and Marine Resource Department's (SCWMRD) regulations for governing Wildlife Management Areas (WMA). These regulations state, "On WMA lands, motor driven land conveyances must be operated only on roads or designated trail." Most of the Forest is included in the WMA program.

Hunting: The Forest offers the largest and most consolidated area available for public hunting in the state. All but a small portion of the Forest is part of the WMA program. Land in this program is available to the public for hunting and fishing. The regulations governing these activities are proposed and enforced by SCWMRD in cooperation with the Forest Service. As the amount of private land in the WMA program declines, more people are turning to the Forest for hunting opportunities. The Forest represents approximately 94 percent of the total public hunting area in the tri-county area of Charleston, Berkeley, and Dorchester counties. The area is also significantly used by Georgetown county residents. The number of hunting licenses and WMA permits sold in Charleston and Berkeley counties has steadily increased in recent years. This increase in license sales and permits, coupled with the shrinking acreage available in the WMA program, results in an increased demand for hunting opportunities on the Francis Marion. The high demand for hunting in the lowcountry of South Carolina may be due to the longest hunting season in the continental United States, and the generous take limits especially for the white-tail deer. South Carolina is one of the few states in which a buck can be legally taken in velvet, (a natural covering over the antlers which is rubbed off by early fall). This in itself attracts many out–of–state users. Although demand for hunting is still increasing, it's not growing as fast as it once did. The number of big game hunters (deer and turkey) has generally increased, while the number of small game hunters shows a slight decline (Flather and Hoekstra, 1989).

Fishing: Demand for fishing in this area is extremely high as evidenced by the number of fishing licenses sold. Berkeley and Charleston counties accounted for approximately 11 percent of those sold statewide. The demand and popularity of fishing are increasing faster than for hunting. The demand for fishing is expected to continue to increase. According to a study done by SC Park, Recreation and Tourism Department (SCPRT), approximately 39 percent of the population in SC participates in fishing. The warm-water streams in the Forest are not as heavily fished, as the managed ponds. A large portion of the rural population participates in fishing. According to the observations by Forest personnel, local demand for warm-water fishing exceeds supply by greater than ten-fold. A few ponds are over fished based on the unbalanced bass to bream ratios often found in these ponds. For a more detailed account of hunting and fishing demand see the process records and the *Analysis of the Management Situation.*

Nonconsumptive wildlife use: Nonconsumptive uses of wildlife and fish resources include those activities that do not result in the taking of an individual animal. This includes bird watching, photography, and other wildlife observation activities. Such activities have been increasing in recent decades. Approximately 74 percent of the US population participates in some form of non-consumptive recreation (Flather and Hoekstran, 1989). In South Carolina, approximately 62 percent of the population participates in non-consumptive activities (USFWS, 1989). As a result of limited access to private lands, more people are turning to public lands such as the Forest to enjoy such non-consumptive uses.

Environmental Consequences

Effects by Alternative

The effect of the alternatives on the recreational environment can be summarized by comparing the estimated use in the short term (the year 2000) and in the long term (the year 2030) of various activities and the capacity for these uses by alternative. For certain uses where the capacity is much greater than the demand, users will find a greater variety of facilities or trails. The recreation opportunity spectrum is also used to compare opportunities for recreational resources. The major differences in alternatives is the number of proposed facilities, capacity and developmental level. The major difference in all alternatives in relation to the recreation opportunity spectrum is the acres of semi-primitive motorized. This difference is displayed in Table III-16 and on the ROS maps found on pages II-91 through III-94.

Table III-16.	ROS acres allocated by alternative.				
	Alternative				
ROS	A	B	C	D	F
Rural	83,883	85,781	85,181	82,930	82,512
Roaded Natural	134,049	144,434	144,434	133,193	126,219
Semi-primitive Motorized	11,946	263	263	13,755	21,147
Primitive	13,549	13,549	13,549	13,549	13,549
Excluded	6,076	6,076	6,076	6,076	6,076

Alternatives A and C do not propose any facility construction. The effects of no new facility construction on the recreation resources is that some activities' supply will be less than the demand. In both the short term and long term OHV trails and picnicking are two activities in which the demand will be more than the Forest supplies. Developed camping in the short term will only barely fulfill demand and in the long term will not fulfill demand. The major difference in these two alternative is the ROS classification and proposed additional wilderness. The ROS for Alternative A allocates 5 percent (total forest acres) in a semi-primitive motorized ROS class. The ROS for alternative C does not allocate any additional semi-primitive motorized acres. Alternative A recommends both roadless areas for wilderness which will increase the primitive recreational experience. Alternative C does not recommend the roadless areas for wilderness.

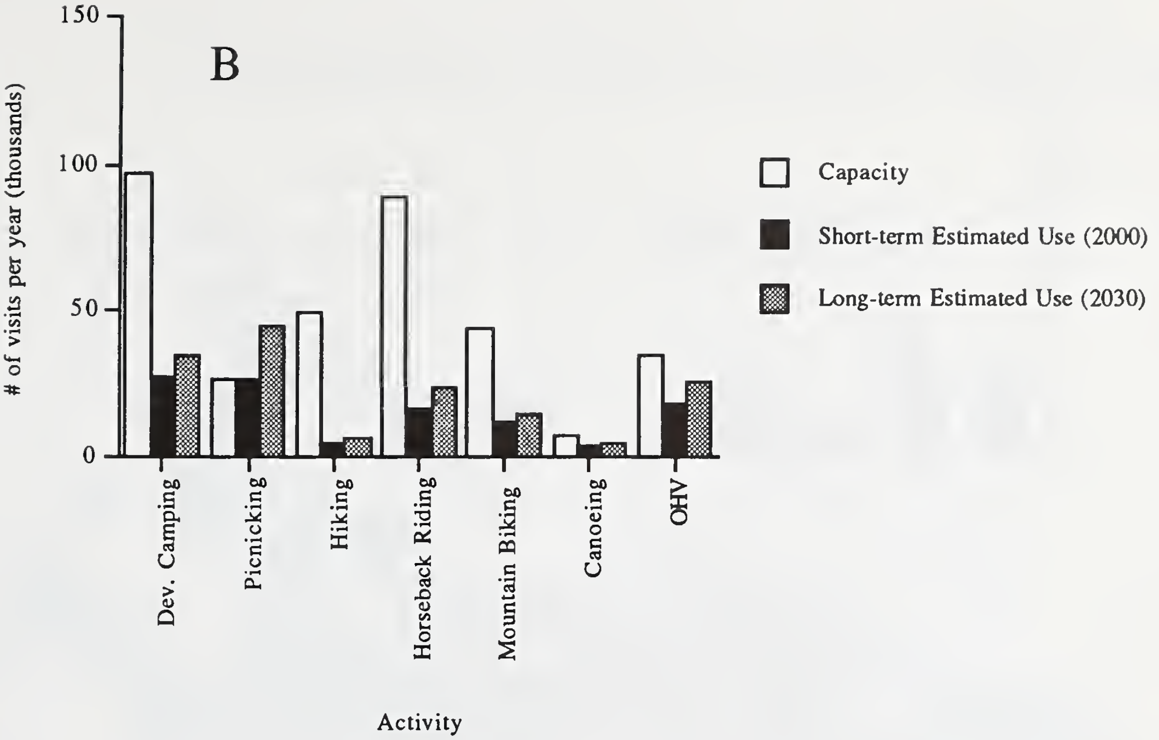
Alternative B is somewhat more developed than A and C, with the probable construction of two campgrounds and two boat ramps. The development levels for the new facilities is a medium level. The capacity for developed camping is about three times greater than the demand in the short term and long term. The capacity for mountain biking is three times greater than the demand in the long term and four times the demand in the short term. The capacity for horseback riding is about four times greater than the demand in the long term and five times greater in the short term. The capacity for hiking is eight times the demand in the long term; eleven in the short term. Picnicking capacity will not fulfill the demand in the short or long term. The ROS for alternative B does not propose any additional semi-primitive motorized acres, but the roadless areas are recommended for wilderness designation which will increase the primitive recreational experience.

Alternative D is next to the highest developed recreational alternative with the probable construction of two boat ramps, two canoe access points, two horse camps, and two campgrounds. The development levels of the new facilities are medium to highly developed. The capacity for developed camping is three times the demand in the long term. The capacity for mountain biking is twice the demand in the long term and three times the demand in the short term. The capacity for horseback riding is almost four times the demand in the long term and six times, short term. The capacity for hiking is twelve times the demand long term; seventeen, short term. Picnicking capacity will

not fulfill the demand for that activity short term or long term. The ROS for alternative D proposes an additional 6 percent (total forest acres) of a semi-primitive motorized class.

Alternative F is the most highly developed alternative with the probable construction of two boat ramps, five canoe access points, two horse camps, and three campgrounds. The development levels of the new facilities is highly developed. The capacity for developed camping is three times the demand long term, and four times, short term. The capacity for horseback riding is almost four times the demand long term and six times, short term. The capacity for hiking is twelve times the demand long term and seventeen, short term. Picnicking capacity will not fulfill the demand for that activity in this alternative. The ROS for alternative F proposes an additional 8 percent (total forest acres) of a semi-primitive motorized class, more than any other alternative.

Figure III-16 shows the capacity and estimated use of recreational facilities for both short and long terms for all alternatives.



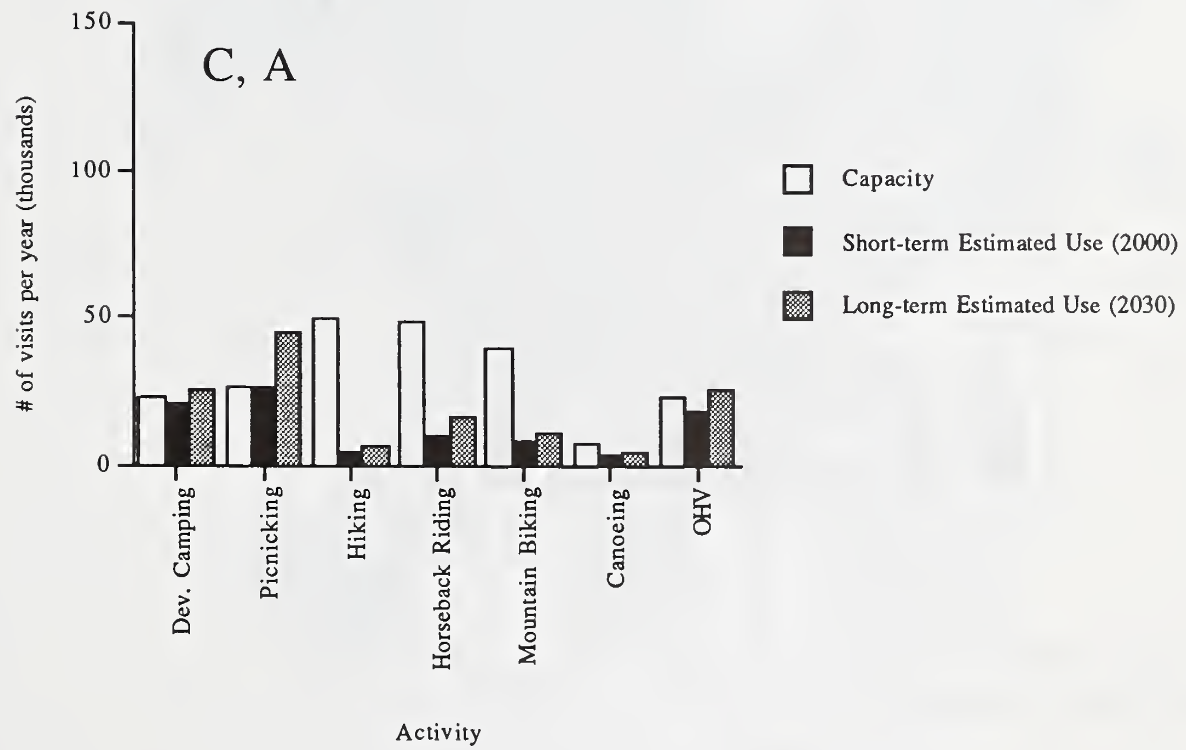
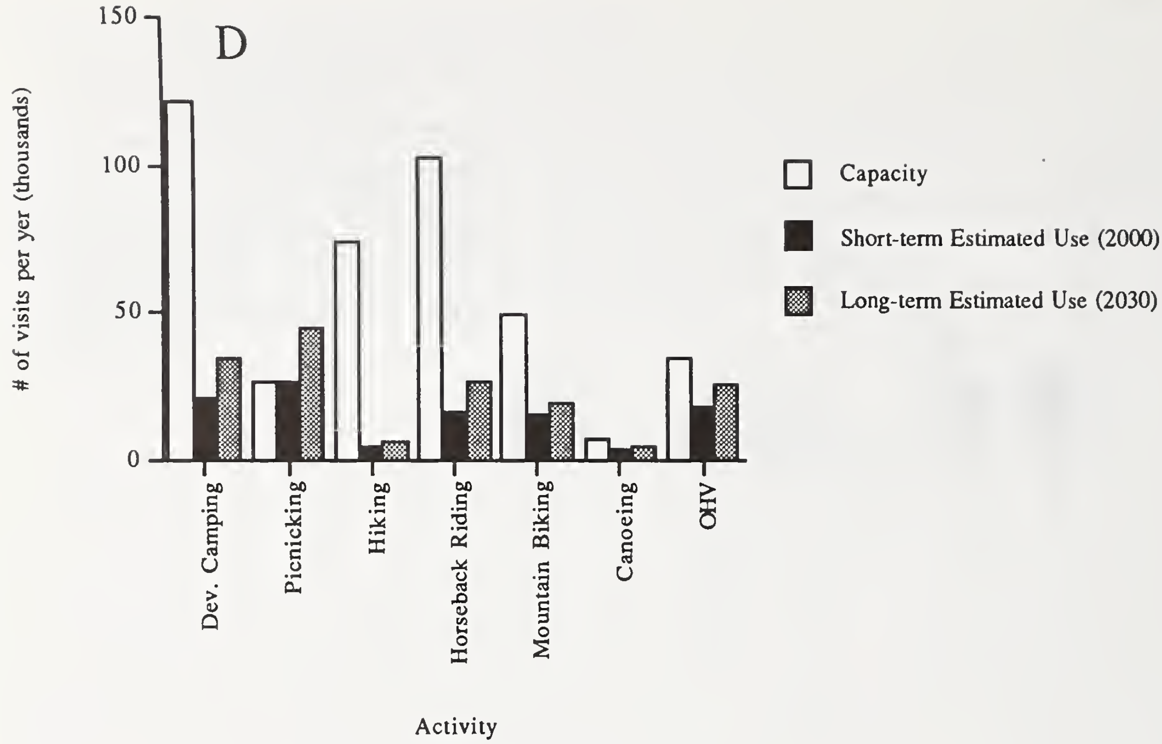
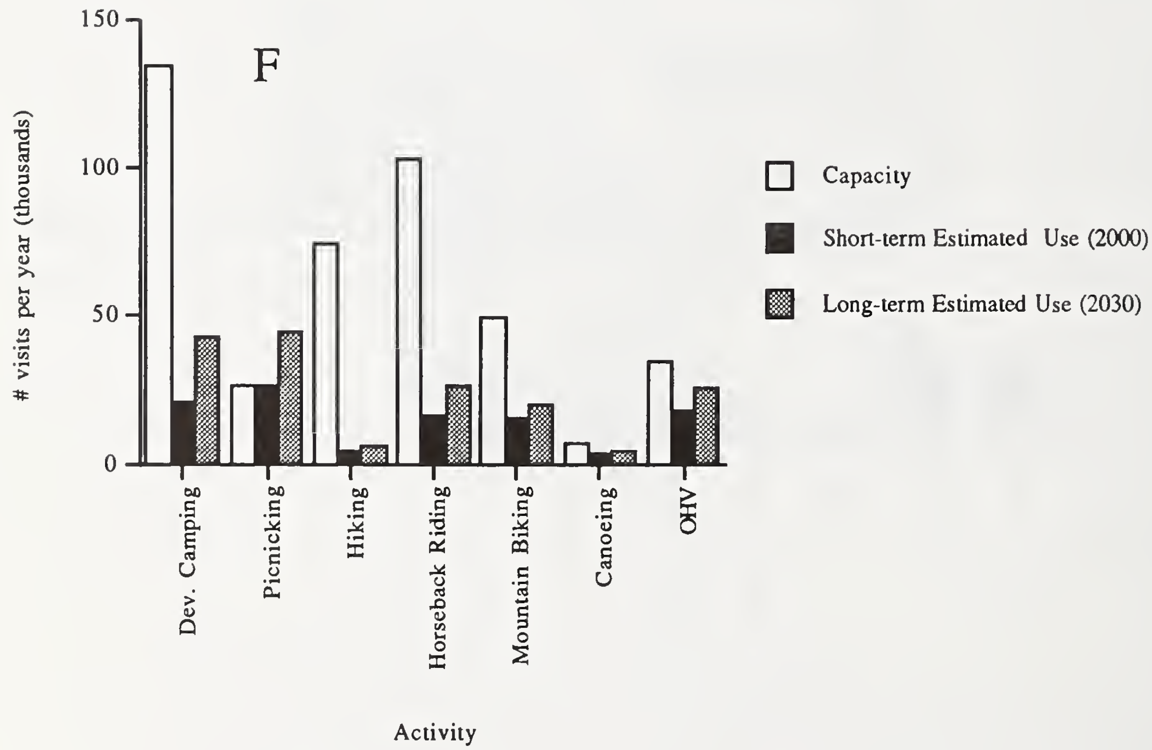


Figure III-16. Capacity and estimated use of recreational facilities in the years 2000 and 2030 for all alternatives.


D
150
100
50
0
# of visits per yer (thousands)
Dev. Camping
Picnicking
Hiking
Horseback Riding
Mountain Biking
Canoeing
OHV
Activity
Capacity
Short-term Estimated Use (2000)
Long-term Estimated Use (2030)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150
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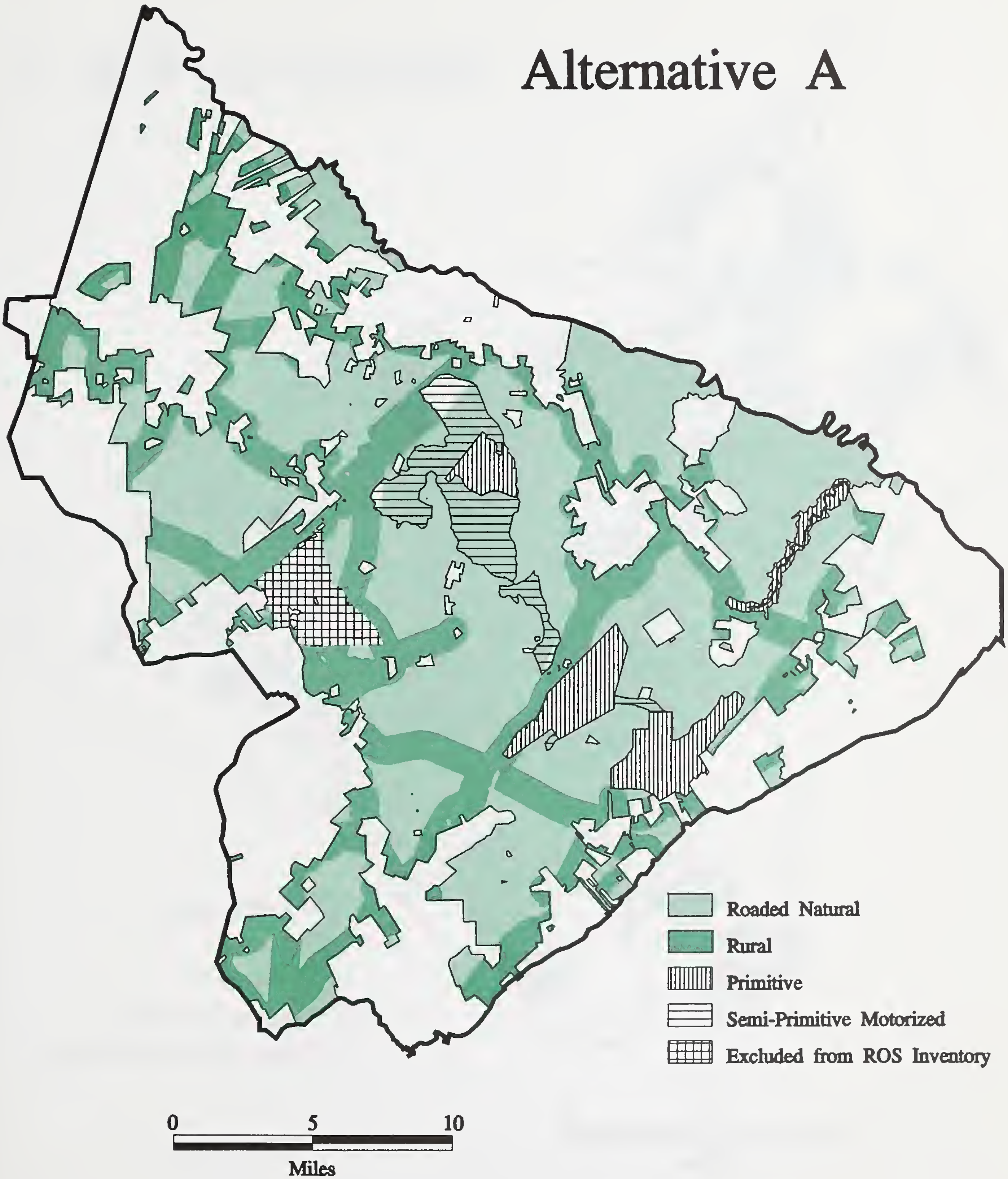
visits per year (thousands)
Dev. Camping
Picnicking
Hiking
Horseback Riding
Mountain Biking
Canoeing
OHV
Activity
Capacity
Short-term Estimated Use (2000)
Long-term Estimated Use (2030)

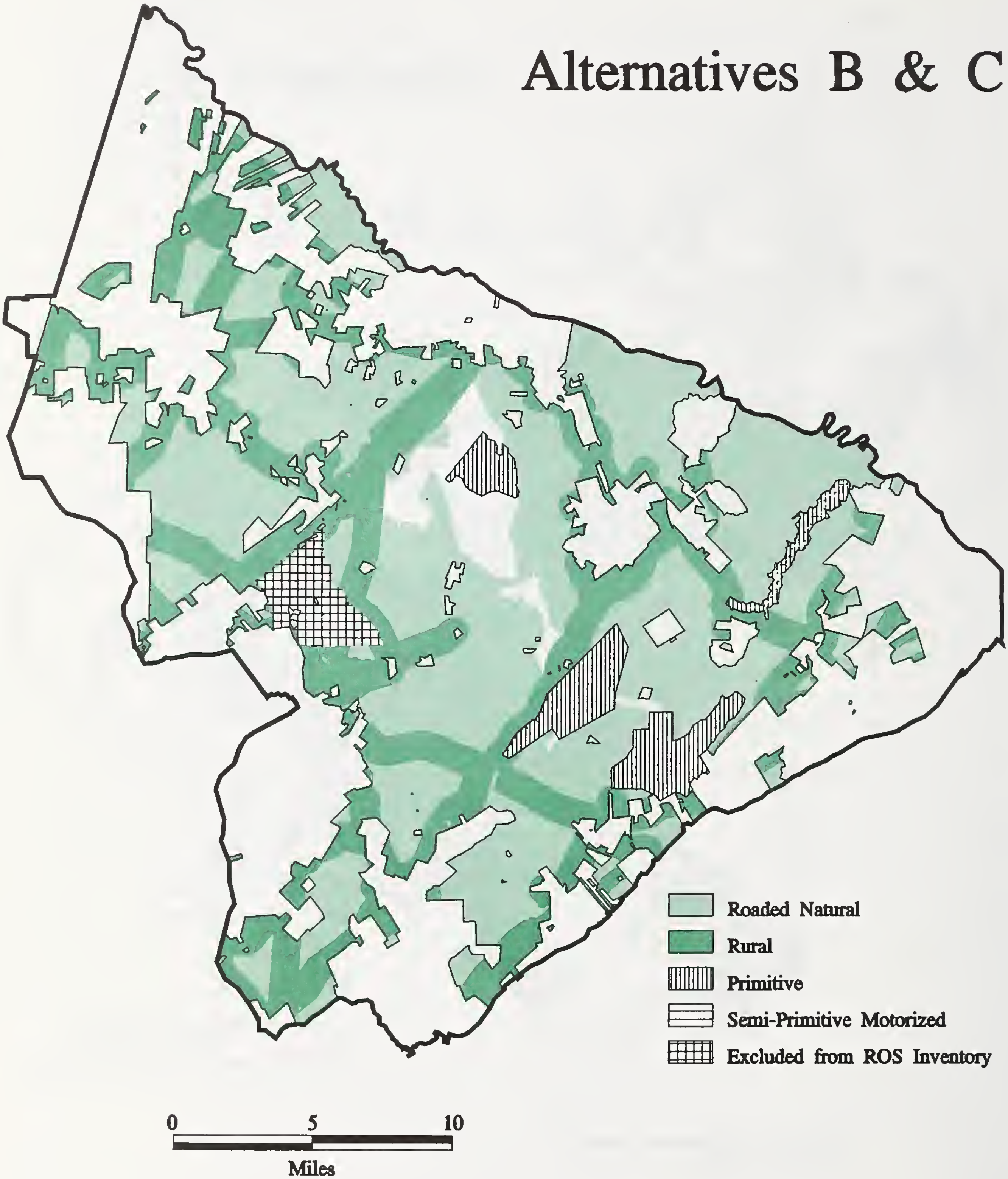
Recreation Opportunity Spectrum

Alternative A

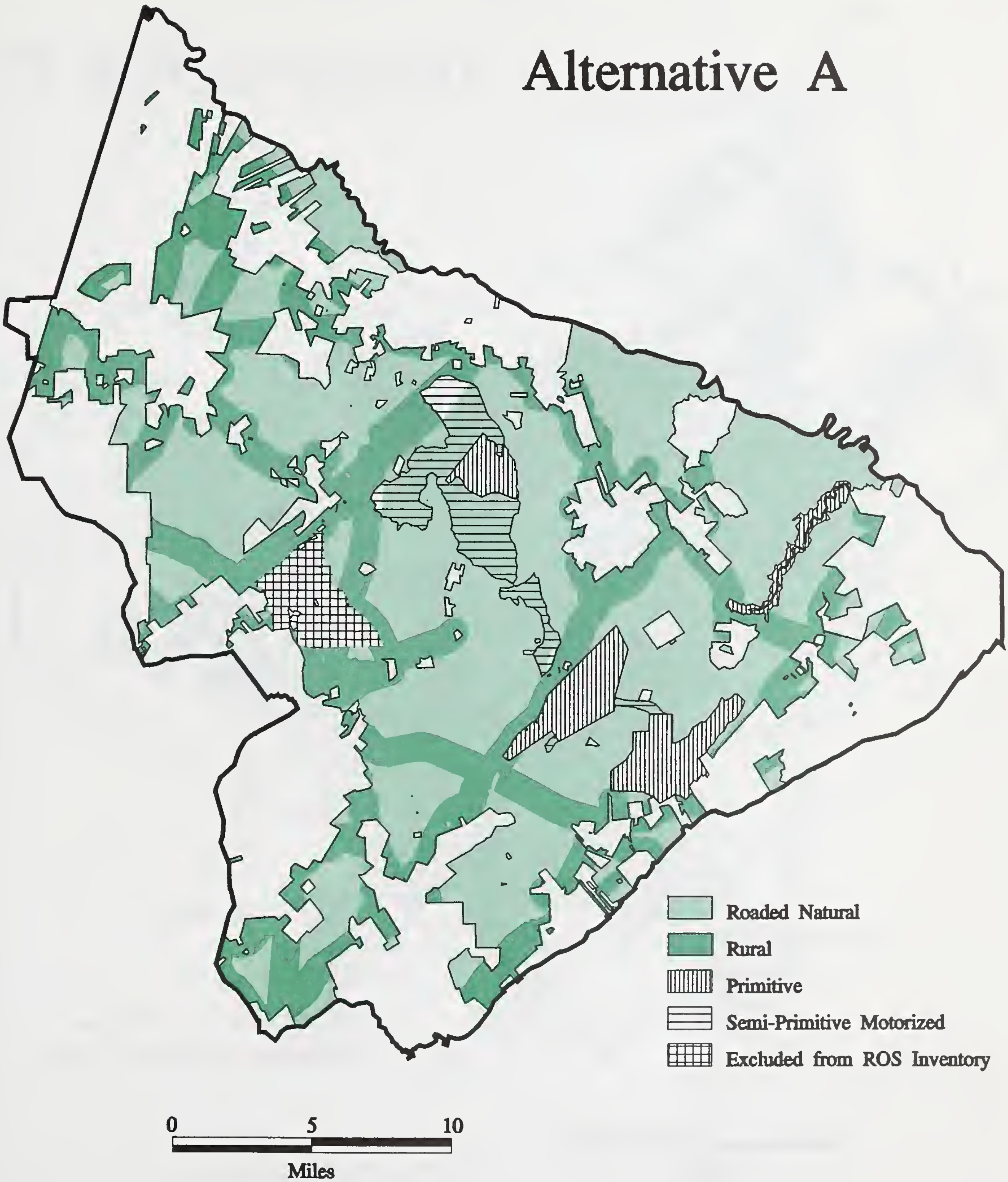


Recreation Opportunity Spectrum

Alternatives B & C

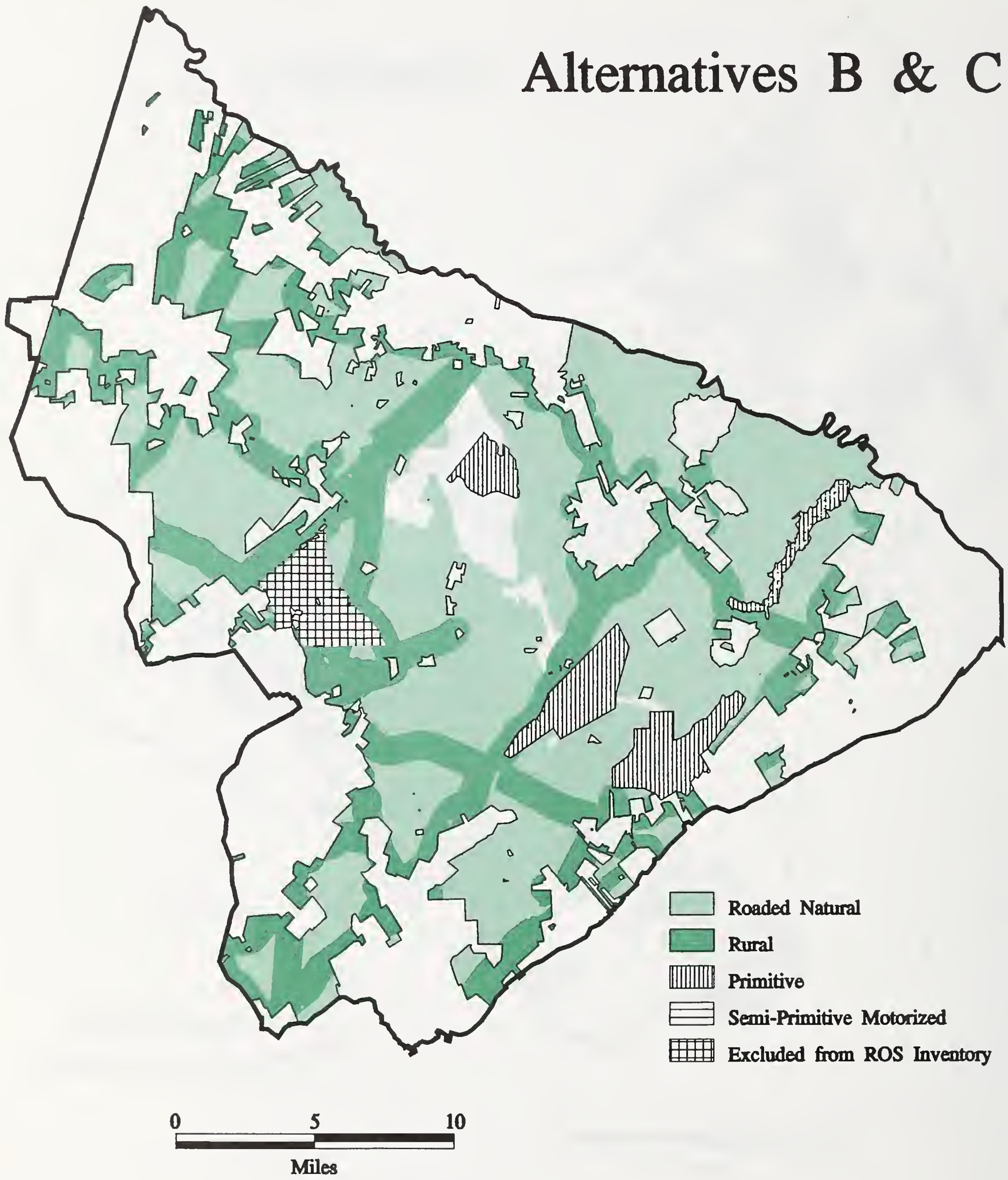


Recreation Opportunity Spectrum



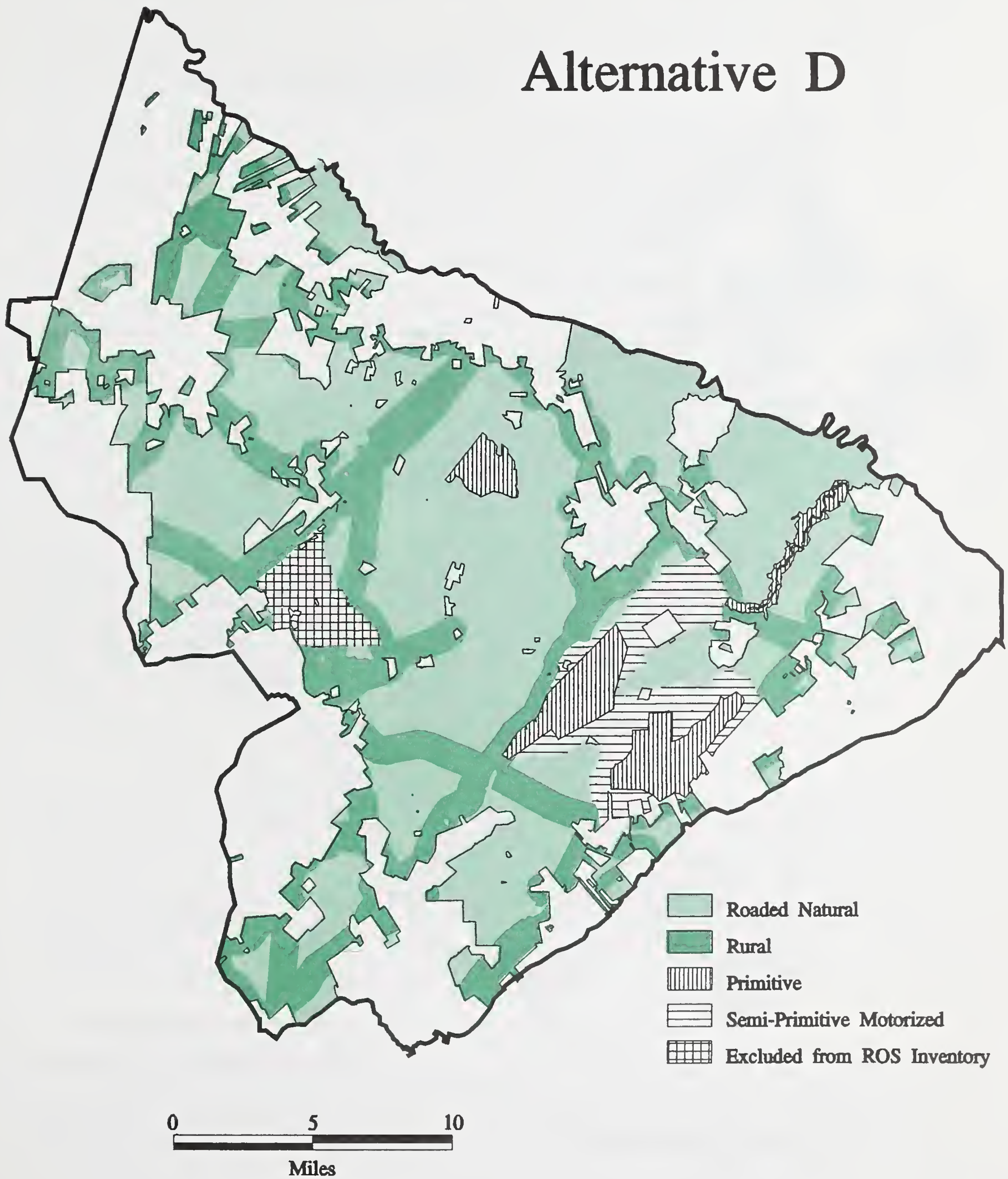
Recreation Opportunity Spectrum

Alternatives B & C



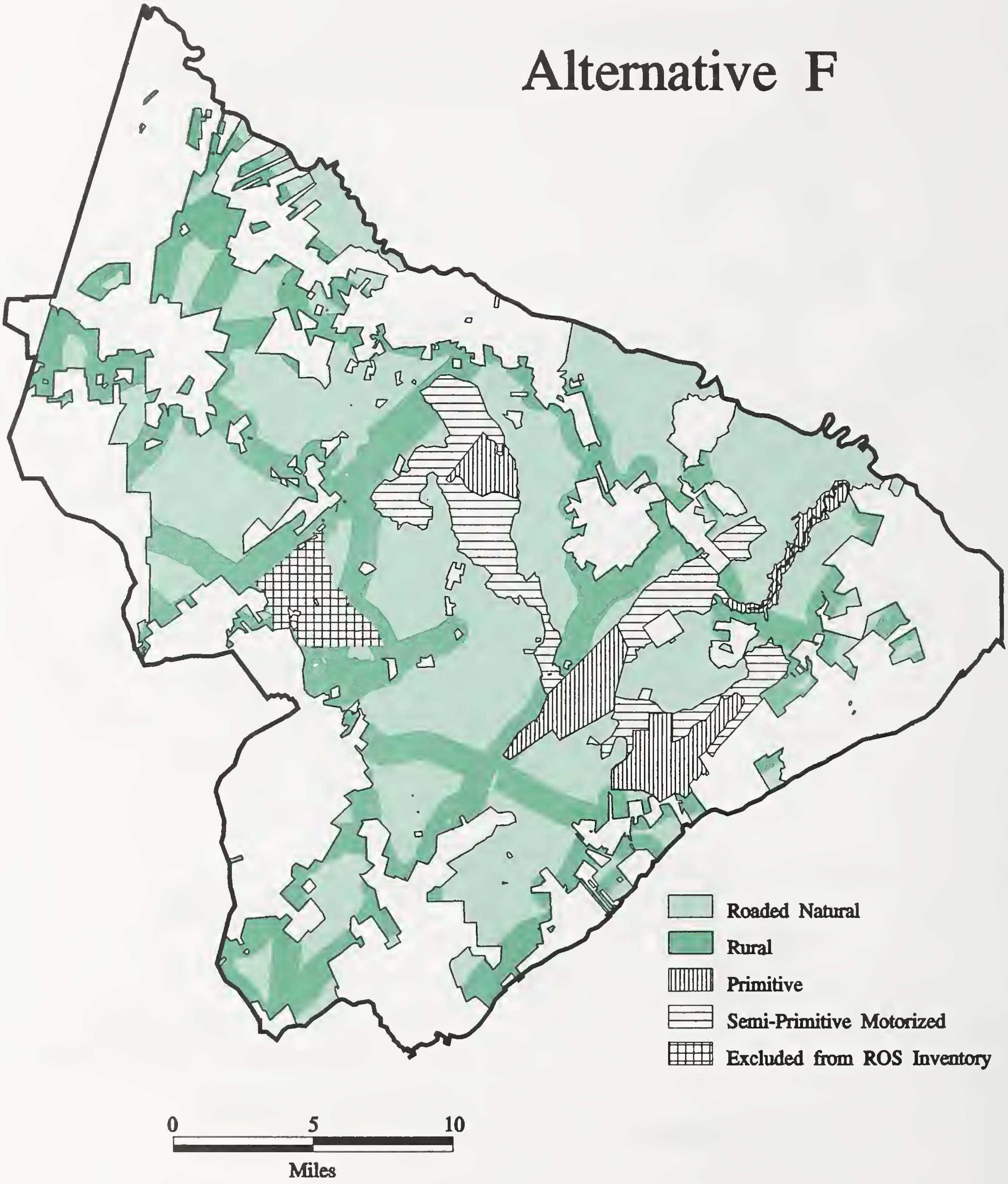
Recreation Opportunity Spectrum

Alternative D



Recreation Opportunity Spectrum

Alternative F



Effects of Probable Activities

Constructing developed recreational facilities, constructing trails

New facilities and trails should result in greater user satisfaction. Well designed and located facilities and trails should increase Forest visitors and provide a variety of experiences. If new facilities and trails are scattered across the Forest, users will be dispersed across the forest. Some new facilities may provide better access to existing trails. Adding more facilities and trails may result in all sites being under used, if the total number of Forest users does not increase. Constructing high quality facilities which offer unique experiences and should increase visitors to the Forest. Some conflicts may arise between people wanting modern facilities and those wanting more primitive sites. New trails will improve access to some areas, depending on location. Different types of trail construction will change recreational patterns. Addition of bicycle trails will add a trail type not previously provided. More facilities and trails may improve access for fishing, hunting, wildlife viewing and boating, depending on location. More user conflicts may arise. More developed recreational areas may reduce land available for hunting. The estimated number, type and capacity of developed recreational facilities and trails are found in Tables III-1a, b and c.

Maintaining developed recreational facilities; maintaining trails.

Well maintained facilities and trails will encourage use and provide a higher quality experience than poorly maintained trails. An adequate level of maintenance will be provided in all alternatives.

Charging user fees

Fees may discourage use for low income users. People may go to other areas if they are available and competitively priced. Alternatives B and D emphasize collecting user fees where possible.

Closing roads

Closing roads will limit access to some areas and limit the opportunity for some users, such as the physically challenged, to participate in activities such as hunting, fishing, camping and non-consumptive wildlife use. Closing roads could increase the satisfaction of those users who prefer solitude and less disturbance by motorized vehicles. Closing roads will benefit law enforcement and should reduce ease of wildlife poaching on the Forest. There may be more opportunities for hiking, bicycle riding and wildlife viewing in closed roads. The estimated miles of closed roads by alternative are found in Tables III-1a, b and c.

Constructing roads; reconstructing roads; maintaining roads

Constructing roads will provide access to previously inaccessible areas and may reduce travel time to facilities and trails. Roads can produce effects such as noise and dust that damage primitive recreational experiences. Reconstructing roads will improve the condition of existing roads and increase satisfaction of users. In alternatives which increase recreational facilities, a small amount of construction may be necessary for proper access. The estimated miles of road reconstruction by alternative are shown in Tables III-1a, b and c. Well maintained roads will increase user satisfaction and provide a more positive recreational experience for some forest users. All open roads will have adequate maintenance in all alternatives. The construction of roads and the types of road constructed has a direct bearing on the ROS class. Higher road density leads to a ROS class of rural or roaded natural and decreases opportunities for primitive or semi-primitive recreation.

Cross-country motorized vehicle travel

Allowing cross country motorized vehicle travel will provide a use that is currently limited on the Forest and satisfy a demand for this type of use. The Forest would be more accessible to physically-challenged visitors. The total number of Forest OHV users may increase as use is less restricted. Areas previously open only to foot or horseback travel will be open for people with motorized vehicles. Recreational facility use may increase as people

camp or picnic in order to ride through the Forest. Law enforcement problems such as poaching wildlife, illegal plant collecting and littering may increase. Noise from this activity will disturb users preferring solitude. This use may also conflict with other uses such as horseback riding, hunting and bird watching. Conflicts in the existing Wildlife Management Area regulations will need to be addressed in the preferred alternative to provide consistency. The OHV use comparisons by alternative are found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

These activities will increase the opportunities for wildlife viewing and hunting on the Forest. There will be little effect on developed or other dispersed recreational uses. Tables III-1a, b and c show the estimated acres of wildlife openings constructed and maintained by alternative.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine; managing hardwood in pine stands; managing transitions and inclusions

The effects of these activities include enhancing some recreational experiences because of an increased diversity of understory species, increased wildlife viewing opportunities and an increased feeling of enclosure. Additional effects of these activities on developed recreation are related to methods discussed under harvesting trees, establishing regeneration, prescribed burning, applying herbicides and timber stand improvement.

Harvesting trees

Harvesting trees may diminish recreational experiences of users seeking solitude and "natural" conditions. Most recreational activities will be temporarily interrupted in active timber sale areas. Thinning stands may provide more opportunities to view wildlife and walk through the area. Tables III-1a, b and c show the estimated acres of harvest by alternative.

Establishing regeneration; prescribed burning; applying herbicides; timber stand improvement

These activities will have minimal effects on recreational experiences. Some recreational use may be temporarily interrupted on the sites where these activities are occurring. Smoke from prescribed burning may also temporarily interrupt recreational activities in the vicinity of the burn. These activities mainly affect user expectations in relation to the recreational experience. Users more satisfied with an undisturbed condition will be less satisfied as these activities become more widespread. Most of these activities open up the Forest and reduce the amount of brush in the understory. This may provide more opportunity for recreation. The estimated amount of these activities by alternative is found in Tables III-1a, b and c.

Special Uses

Current Condition

There are 137 special use permits covering 2,263 acres of land. Over 82 permits are for rights-of-way. The remainder are for utilities, wells, administrative sites, agriculture, community playgrounds, drainage ditches and cemeteries. Grazing use on the Francis Marion ceased in 1970, and there has been no interest or application for grazing permits since then.

Environmental Consequences

Effects by Alternative

The probable activities under all alternatives will have little effect on the current special use program, since most of the activities occur under the current plan. The most significant effects of the alternatives on special uses result from the general management direction of the alternative, the allocation of land to management areas and the management direction of the management areas. Special uses permitted will be consistent with this direction in the alternatives. Alternative management direction, management area descriptions and allocation of land by manage-

ment area are found in chapter 2.

Wilderness

Current Condition

Four wildernesses were established by Congress on the Francis Marion National Forest in 1980. Table III-17 shows the current surveyed acreage. The location of the wildernesses is found on the management area maps in chapter 2.

Table III-17. Wilderness Acres	
Wilderness	**Acreage**
Hellhole Bay	2,180
Wambaw Swamp	4,767
Little Wambaw Swamp	5,154
Wambaw Creek	1,825
Total	**13,926**

Most of the areas have standing water during the wet season. Presence of water, thick brush, abundant insect pests, high summer temperatures and lack of vistas inhibit most visitors who are seeking hiking and camping opportunities. There are, however, unique plant and animal communities scattered throughout these areas which attract some visitors.

Wambaw Swamp and Little Wambaw Swamp were in the direct path of Hurricane Hugo and suffered severe blowdown. Hell Hole Bay sustained moderate blowdown. Wambaw Creek lies north of the main wind path, and blowdown was minor.

All four of these areas provide opportunities for nature study, photography, hunting, and fishing. There are approximately 11 miles that outboard boats and canoes can travel in Wambaw Creek Wilderness Area. Hellhole Bay Wilderness Area has approximately 1.5 miles of non-motorized canoe trail.

Environmental Consequences

Effects by Alternative

The Wilderness Act of 1964 states that Wilderness is to be managed in such a manner "devoted to the public purposes of recreational, scenic, scientific, educational, conservation and historical use" to the extent that the essential wilderness character of the area is protected.

The four Francis Marion National Forest Wildernesses will be managed under the provisions of the Wilderness Act to minimize the impact of man and his technology upon the wilderness resource. The forces of nature will dominate the landscape and human activity will be limited to that of an unobtrusive observer. Manipulation of the flora, fauna, or the surface of the land will be allowed only to the extent necessary to meet the conditions of the Wilderness Act. The most significant effects on wildernesses are amount and type of recreational use within a particular area. All alternatives should have approximately the same amount of wilderness use. No additional trails or other facilities are planned for these areas. The wildernesses are extremely swampy and inaccessible at times which limits recreational use.

An indirect effect on wilderness is management direction on adjacent management areas and the proximity of management activities to the wilderness boundaries. The majority of activities listed in Table III-a, b and c are not permitted in wilderness and thus would have limited direct effects on wilderness. These activities may indirectly affect wilderness experiences depending on their proximity to wilderness.

In alternative A, the roadless areas are recommended for wilderness designation. This will effect wilderness by increasing wilderness acreage and thus increasing primitive recreational opportunities. The management direction of alternative A does not emphasize commodity production and may cause the management areas surrounding the wilderness areas to produce fewer indirect effects than current management.

In alternative B, the roadless areas are recommended for wilderness designation. This will effect wilderness by increasing wilderness acreage and thus increasing primitive recreational opportunities. The wilderness may have more indirect impacts caused by management activities taking place in surrounding management areas. Generally, the smaller the wilderness the greater effects of activities next to its boundaries.

Alternative C does not recommend the roadless areas for wilderness designation. The existing wilderness may

have more indirect impacts caused by management activities taking place in surrounding management areas.

Alternative D does not recommend the roadless areas for wilderness designation. Two of the wildernesses have at least 75 percent of their boundaries surrounded by a management area which emphasizes a "lighter touch" on the landscape. This management area will help protect wilderness characteristics especially ones that are affected by the small size of the wildernesses. The remaining two wildernesses may have more indirect impacts caused by proximity to management activities taking place in surrounding management areas.

Alternative F does not recommend the roadless areas for wilderness designation. One of the wildernesses have a majority of its boundary surrounded by a management area which emphasizes a "lighter touch" on the landscape. This management area will help protect wilderness characteristics especially ones that are affected by the small size of the wilderness. The remaining three wildernesses may have more indirect impacts caused by proximity to management activities taking place in surrounding management areas.

Effects of Probable Activities

Constructing developed recreational facilities; maintaining developed recreational facilities; constructing roads; reconstructing roads; maintaining roads; constructing wildlife openings; maintaining wildlife openings

Wilderness management prohibits constructing recreational facilities, roads and wildlife openings within wildernesses. However, these activities can take place directly adjacent to the boundaries. As more management activities take place adjacent to the wildernesses, there will be increased opportunities for motorized and mechanized vehicle trespassing, an increase in noise from commercial and non-wilderness recreational activities and more risk of wildfire. As use increases, the opportunities for solitude and remoteness begin to diminish on the edges of wildernesses.

More recreational facilities may increase wilderness use by bringing more people into the Forest. There will be more opportunities to interpret the value of wildernesses.

The degree of the direct and indirect effects depends on the management activity, intensity of the activity and location. The amount of estimated new recreational facilities, estimated acres of new wildlife openings and estimated miles of road reconstruction by alternative are found in Tables III-1a, b and c.

Constructing trails; maintaining trails

Trails facilitate and organize recreational use within designated wildernesses. Trails allow people to take advantage of primitive and unconfined types of recreational opportunities. A trail system can also affect the physical and biological aspects of the environment. The wet and mucky soils of these wildernesses will not stand repeated use of foot traffic without becoming very muddy. The most potential for trails in these areas are for campers. Many areas have existing dikes and old travelways suitable for trails. As more people use the Wildernesses, effects such as littering, compaction of bare ground and other human use evidence will increase. Trails increase the impact on self-discovery, increases the possibility of seeing someone else and concentrates use.

Closing roads

Wilderness management prohibits road construction within wildernesses, but roads can be placed adjacent to the boundaries. The type of closure, location and method are important in looking at effects. Total obliteration of roads that are immediately adjacent to the wilderness may increase the wilderness experience by reducing noise, dust, and disturbance, especially on smaller wildernesses. Temporary closure, such as gating, will temporarily reduce noise, dust, and disturbance. Tables III-1a, b and c show the estimated miles of open and closed roads by alternative.

Cross-country motorized vehicle travel

OHV travel is prohibited in wildernesses; however, the general forest area is open to OHV use in some alternatives. Indirect effects such as noise, dust, and disturbance around the boundary of the wilderness detract from the wilderness experience. Closing roads will also limit access to the areas. The four wildernesses are relatively small in size thus the opportunity to get very far away from any boundary is sometimes difficult. ROS class in adjacent tracts can have a mitigating effect. The OHV policy comparison by alternative and the estimated miles of OHV trails

by alternative are found in Tables III-1a, b and c. The ROS maps by alternative are found in the recreation section.

Harvesting trees

Vegetative manipulation will be permitted only for the protection of PETS plant and animal species or communities or when needed to control wildfire or to reduce risk to public health and safety. Harvesting is allowed in adjacent stands, and there can be indirect effects such as noise, smell, and dust. These are all dependent on location of harvest, method, number of total acres harvested and machinery used. Visual quality objectives and ROS classification in adjacent tracts can help mitigate those effects. The estimated harvest acres by alternative are found in Tables III-1a, b and c. The visual quality objectives by alternative are found in the visual quality section, and the ROS maps are found in the recreation section.

Converting pine stands to mixed stands; converting loblolly pines to longleaf pine; establish regeneration; apply herbicides; timber stand improvement; managing hardwood in pine stands; managing transitions and inclusions

Any type of timber management in wildernesses is prohibited except in cases of insect, disease and habitat for PETS. However, these activities can take place directly adjacent to the wildernesses. The indirect effects of these activities depend on the management activity, intensity of the activity, number of acres on which the activity will take place, machinery used to perform the activity and location. Tables III-1a, b and c show the estimated amount and relative use of these activities by alternative.

Prescribed burning

Prescribed burning is permitted in wildernesses to reduce fuel loading to protect outside resources and to permit lightning-caused fires to play, as nearly as possible, their natural ecological role.

Periodic low-intensity fires reduce the risk of a catastrophic, high-intensity fire and reduce the risk of insect and disease epidemics which can affect resources inside and outside of the wilderness. Absence of such fires would cause an increase of fuel loading and subsequent increased wildfire hazard.

Exclusion of fires will eventually bring about changes in the wilderness ecosystem, altering both plant communities and the wildlife dependent on them. Unchecked by fire, rapid understory growth diminishes the visual qualities by blocking views.

Clean air is an integral resource of the wilderness and an assumed characteristic of a wilderness experience. Air quality in the wilderness is determined by how much, where, when and what type of pollutants are emitted from sources outside and inside of the wilderness. See the discussion under air quality for these effects. The estimated acres of prescribed burning by alternative are listed in Tables III-1a, b and c.

Roadless Areas

Current Condition

In 1991, a roadless area review was conducted on the Forest evaluating the following existing conditions: 1) the density of improved roads; 2) the acreage in harvested areas less than 10 years old; and 3) size of an area conducive to providing roadless recreational experiences. The Geographic Information System was used to display transportation systems, stand ages and conditions, endangered species location, cultural resources, soil drainage and recent harvesting activities.

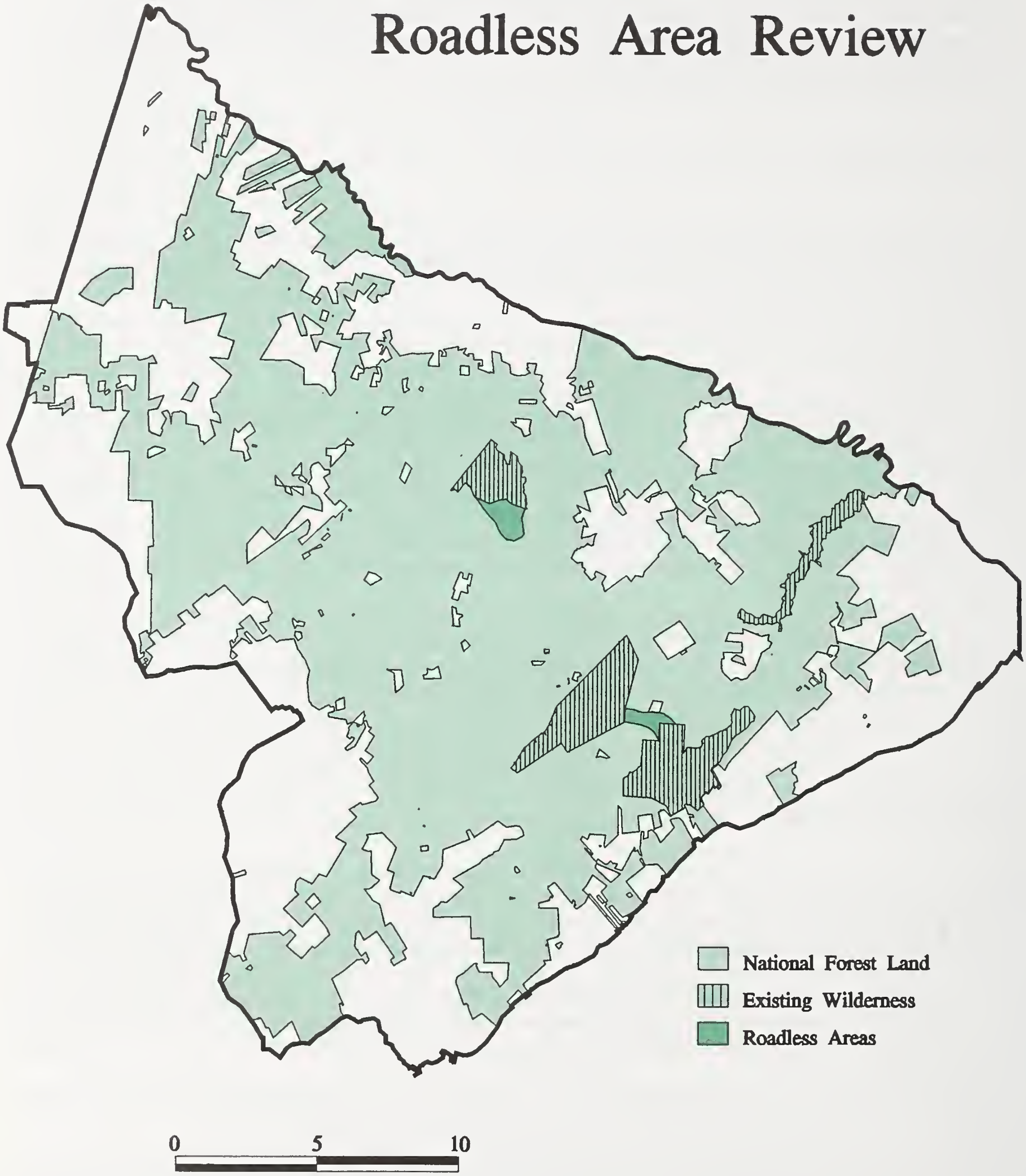
Applying the criteria for a minimum of one half mile of improved road per one thousand acres eliminated all areas outside of existing wildernesses for consideration as candidate roadless areas. The only areas with a potential to be classified as roadless areas are adjacent to existing wildernesses. These areas are:

1. The area adjacent to the south side of Hell Hole Bay. This area was part of RARE II inventories area (Hell Hole Bay "L8110). It qualifies for inventory because it is of a sufficient size. (890 acres)

2. The area on the northwest side of Little Wambaw Swamp Wilderness. Although one side is bounded by a county road, this area has roadless characteristics and is of sufficient size to qualify. (530 acres)

A more detailed explanation and summary of the roadless area review is found in Appendix C.

Roadless Area Review



Environmental Consequences

Effects by Alternative

Maintaining roadless areas with potential for wilderness designation depends on management area allocation and direction of the alternative. The two roadless areas are recommended for wilderness designation in alternatives A and B. Any recommendation for wilderness designation is a preliminary administrative recommendation that will receive further review by the Chief of the Forest Service, the Secretary of Agriculture and the President of the United States. Final decisions on roadless areas are based on the conditions described in the current condition of roadless areas, density of improved roads, acreage harvested in the last 10 years, and the size conducive to providing roadless recreational experiences.

There are no adverse effects on roadless area characteristics in alternative A and B because they are recommended for wilderness in those alternatives. The management activities in these areas would have to be evaluated as to their specific effect on roadless area conditions and not detract from a wilderness condition.

Alternative F has minimal effects on current roadless areas because both existing roadless areas in corridors that offer a "lighter touch" on the landscape. This corridor offers protection of the roadless area characteristics by not allowing any road construction within the corridor. This alternative does not recommend the roadless areas become wilderness. Any activities that take place within the roadless area must be evaluated as to their effect on roadless area condition.

Alternative D includes one of the existing roadless areas in a corridor that offers a "lighter touch" on the landscape. The other roadless area is included in a general forest area with no special management area protection. Any activities that take place in this area, however, must be evaluated as to their effect on roadless area conditions.

Alternative C does not include either of the roadless areas in any special corridor. The areas are still considered inventoried roadless areas and any activities that take place in this area must be evaluated as to their effect on roadless area conditions.

Effects of Probable Activities

Constructing developed recreational facilities; constructing trails

The development of recreational facilities may limit the future potential for more primitive areas. The development of trails may limit the potential for wilderness depending on the type of trail, such as OHV or jeep trails. Tables III-1a, b and c list the estimated amount of these activities by alternative.

Closing roads

Permanent road closure and rehabilitation can result in more areas that could possibly qualify as roadless areas. Also permanent road closure and rehabilitation in areas that are adjacent to existing remote areas could increase the primitive recreational experience. The estimated miles of closed road by alternative are found in Tables III-1a, b and c.

Constructing roads; reconstructing roads; maintaining roads

Road construction within remote areas may preclude future wilderness evaluation and other remote recreational uses. Opportunities for isolation, solitude, and primitive recreation would decrease with road development. The level of maintenance reflects on the quality of the road in time. A road could be converted to a primitive road over time with lack of maintenance or could be upgraded through additional maintenance. Tables III-1a, b and c show the estimated amount of road reconstruction, construction and miles of open roads by alternative.

Cross-country motorized vehicle travel; constructing wildlife openings; maintaining wildlife openings; converting pine stands to mixed stands; converting loblolly to longleaf; harvesting trees; establishing regeneration; prescribed burning; applying herbicides; timber stand improvement; managing hardwood in pine stands; managing transitions and inclusions

These activities may or may not be permitted depending on the management direction of the alternative. A site specific analysis would be completed for the area to assure that any effects would not deteriorate from the quality of the roadless area or preclude them from being recommended for wilderness. See Appendix C for roadless area criteria. Any of these activities that occur adjacent to roadless area boundaries could cause indirect effects depending on the activity, location, number of acres, machinery used, etc. Tables III-1a, b and c show the estimated amount of these activities by alternative.

Wild and Scenic Rivers

Current Condition

The Santee River from the Atlantic Ocean to Wilson Dam on Lake Moultrie is included in the U.S.D.I. Park Service Nationwide River Inventory. Rivers included in this inventory located wholly or partially on National Forest System lands must be considered for possible inclusion into the National Wild and Scenic River System.

An analysis was conducted for the previous planning period, and the river was determined not to meet the eligibility requirements of the Wild and Scenic Rivers Act. This was based on the impacts of the proposed Corps of Engineers Rediversion Canal Project which has since been implemented. No other river on the Forest is listed in the inventory.

Environmental Consequences

Effects by Alternative

Since no rivers are suitable for Wild and Scenic River classification, management activities within any of the alternatives will not effect Wild and Scenic Rivers.

Land Ownership and Use

Current Condition

The Forest lies within some of the least populated portions of Berkeley and Charleston counties. Forty-four percent of Berkeley county's and 22.6 percent of Charleston county's land area is in public ownership (S.C. Budget and Control Board, 1992). Table III-18 shows the distribution of National Forest land in the two counties.

Within the national forest proclaimed boundary, federally owned tracts are distributed in a mosaic of private, county and municipal ownerships. (See Land Ownership Map.) Federal lands are mostly consolidated in the interior but are intermingled with private lands near the perimeter.

Table III-19 shows the current land use, interpreted from satellite imagery by the South Carolina Land Resources Conservation Commission, within the proclaimed Forest boundary. The image was classified into ten classes of land use. This data is used to indicate land use/cover on private land within the proclaimed boundary. Detailed resource information is available for National Forest land but not for adjacent private land. Major land use/cover within the Forest boundary are forest (80 percent), saturated bottomland forest (12 percent), and agriculture/grassland scrub/shrub (5 percent).

Table III-18. Current acreage by county.

County	Acres
Berkeley	189,979
Charleston	59,524
Total	**249,503**

Table III-19. Land use in acres by ownership within the proclaimed boundary.

	National Forest	Private
Urban/Build-up	2	346
Agriculture/Grass	301	7,372
Scrub/Shrub	3,213	11,183
Forest	206,807	125,959
Water	718	3,571
Forested Wetland	36,263	12,745
Non-forested Wetland	1,934	3,872
Barren/Transitional	32	1,157
Uncoded	233	92
Total	**249,503**	**166,297**

Environmental Consequences

Effects by Alternative

In all alternatives, the mixed ownership pattern on the Forest will continue to provide opportunities for land adjustment through exchange, donation and purchase. Exchanges will be considered when they are in the public interest. Recent population trends indicate a shift toward rural living. These population trends may affect the land adjustment program. The effect may be a loss of acres suitable for purchase and exchange or significantly raise land values. Because the laws, regulations and policies are the same in all alternatives, the effects will be similar.

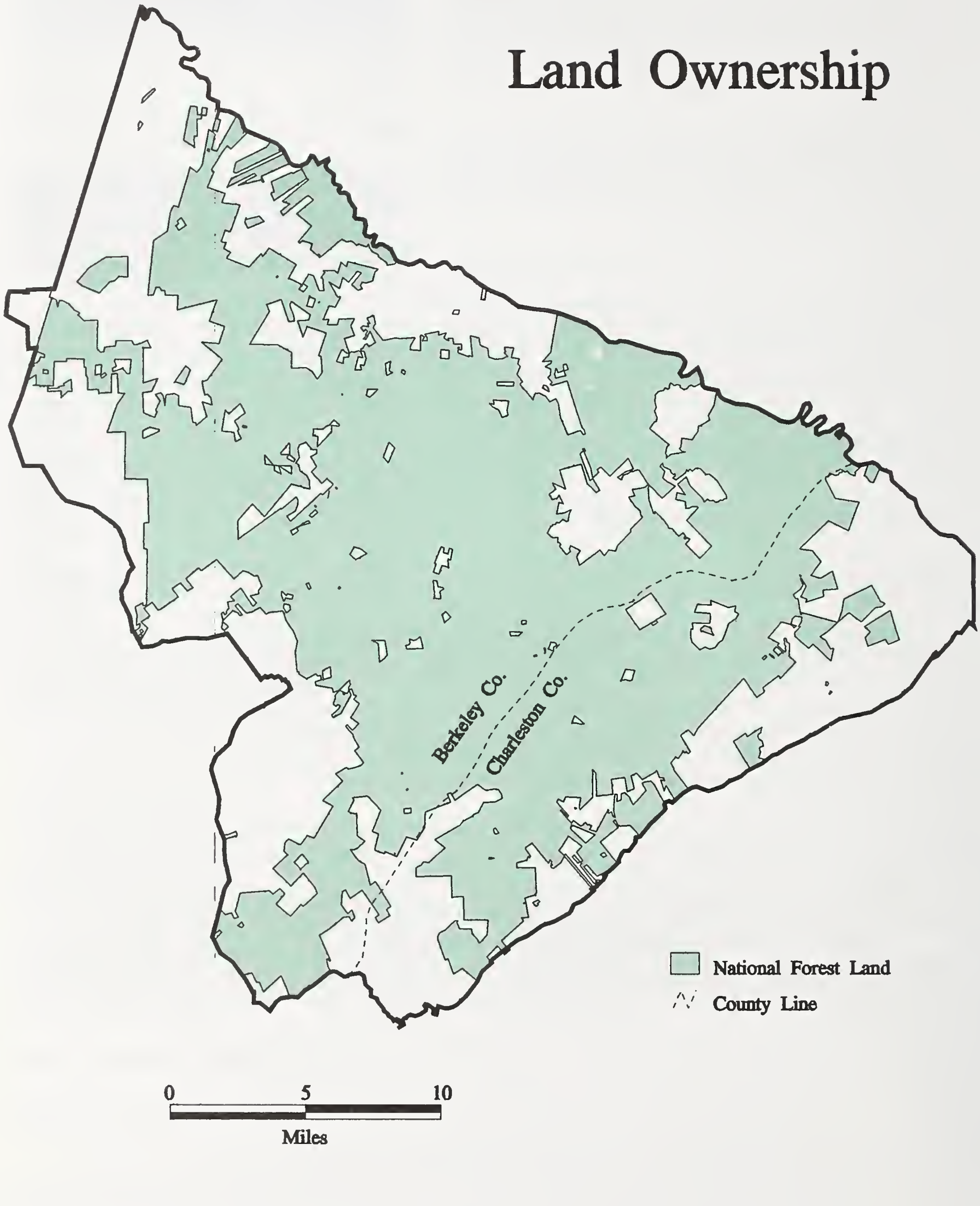
In all alternatives, lands will be acquired based on qualities such as uniqueness, productivity, efficiency of administration, needed critical habitat and others which provide public benefits. The effects in all alternatives are expected to be similar.

Due to the mixed ownership pattern, there is a need for accurate property boundary location where planned activities occur near Forest Service boundaries. The boundary location program is not expected to vary substantially by alternative.

In all alternatives, the expansion or construction of utility, railway and pipeline corridors is consistent with land allocations made in the Forest Plan. Land use is not expected to change substantially in any alternative.

In the alternatives that emphasize expanded developed recreation and increased visitation, business opportunities in the private sector may increase causing minor shifts in private land use from agricultural to urban. This may lead to increased unauthorized use on federal land such as illegal dumping of waste and occupancy trespass.

Land Ownership



Transportation System

Current Condition

There are 603 miles of Forest Service developed roads, 59 miles of Federal highways, 272 miles of state highways and 79 miles of county roads within the proclaimed National Forest boundary.

Forest Service roads are classified as either arterial, collector, or local. Arterial and collector roads provide general access to the Forest. These roads have either gravel or pavement surface. They are maintained for constant use and are suitable for travel by passenger cars.

Local roads are constructed and maintained for constant or intermittent use. Most local roads with constant use have a gravel surface. Intermittent use roads are used during a specific period and then closed between periods of use. Table III-20 shows the road classifications. The Transportation System map shows the distribution of the road system on the Forest.

Table III-20. Classification of roads within the proclaimed National Forest.

Classification	Service Use	Miles	Jurisdiction
Collector/Arterial	Constant	59	US Highways
Collector/Arterial	Constant	272	State Highways
Collector/Arterial	Constant	48	County Roads
Collector/Arterial	Constant	147	Forest Service
Local	Constant	31	County Roads
Local	Constant	299	Forest Service
Local	Constant	N/A	Private
Local	Intermittent	157	Forest Service

Environmental Consequences

Effects by Alternative

Forest Plan guidance for the transportation system is limited to the management of roads within Forest Service jurisdiction. Forest management activities significantly affecting the transportation system are road construction, reconstruction and closing roads. In all alternatives, major travelways or roads needed for through traffic will remain open. Most road closures will be on dead-end roads. Specifically which roads to close is not decided at the Forest Plan level. Mileages found in this EIS are estimates, given the alternative management emphasis.

In the first period, there is little difference among the alternatives in the amount of roads constructed or reconstructed. This is because most of the road construction and reconstruction miles are related to timber harvesting and providing access to new acquisitions which vary little in the first period. All road construction should be completed in the first period in all alternatives. In the long term, the variation in road activity would be differences in miles of reconstruction of existing roads and miles of open Forest Service roads. (See Tables III-1a, b and c.)

Alternative A would have the least miles of roads reconstructed and the least miles of open roads of any alternative in the short term and long term. Miles of opened Forest Service roads would decrease from 446 miles to an estimated 367 miles.

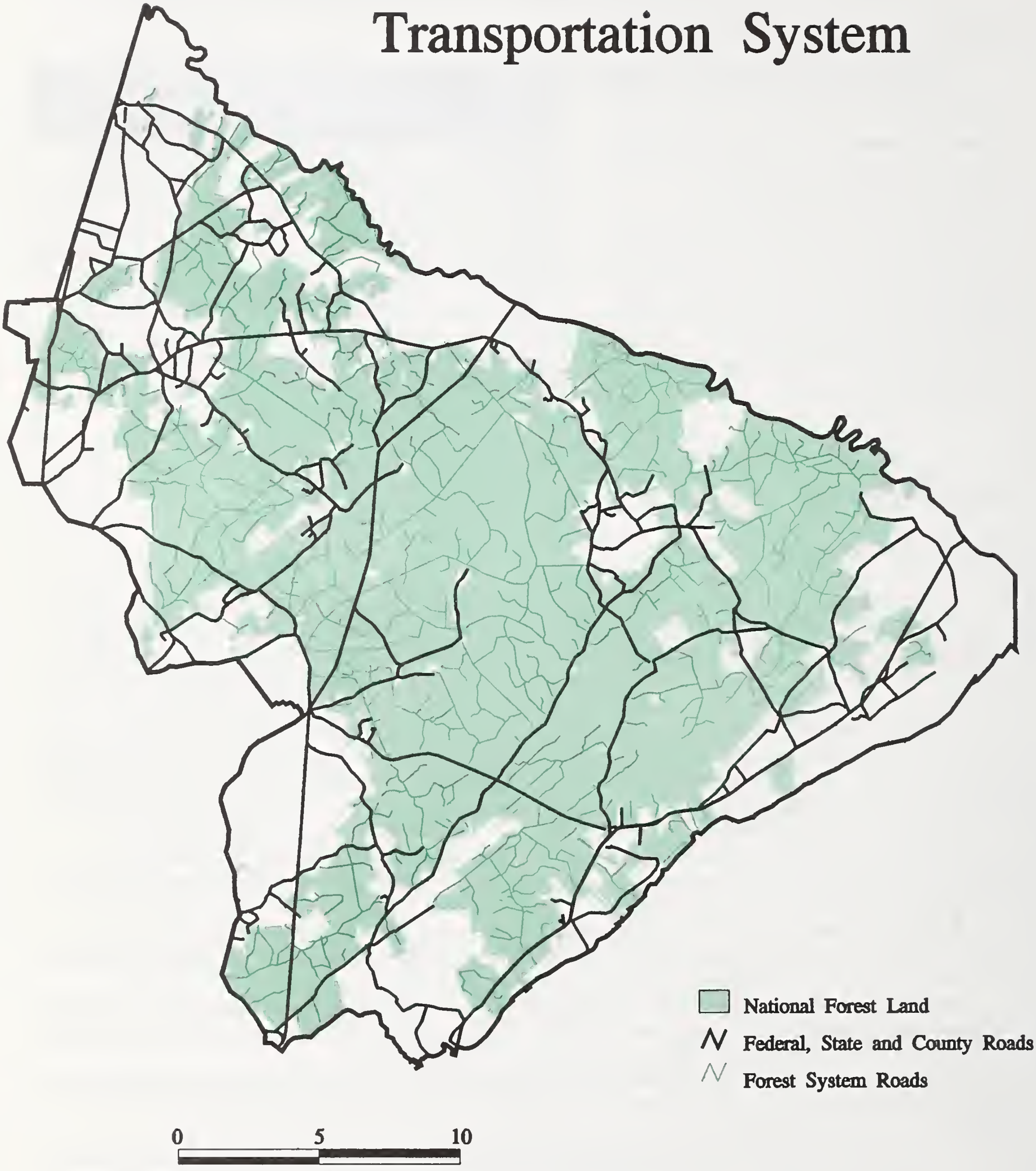
Alternative B would have the most miles of roads constructed and reconstructed and the most miles of open roads of any alternative in the short term and long term. Miles of opened Forest Service roads would increase from 446 miles to an estimated 528 miles.

Alternative C would have the second fewest miles of roads constructed in the first period and the second fewest miles of roads reconstructed in the long term. In alternative C, miles of open Forest Service roads will remain about the same as present with about 446 miles.

Alternative D would have the most miles of roads constructed in the first period and the second highest miles of roads reconstructed in the long term. Alternative D would decrease the miles of open Forest Service roads from 446 miles to an estimated 428 miles.

Alternative F would have the second highest miles of roads constructed in the first period and the third highest miles of reconstruction in the long term. This alternative would decrease the miles of open Forest Service roads from 446 miles to 422 miles.

Transportation System



Effects of Probable Activities

Constructing developed recreational facilities; constructing trails

These activities will have an indirect effect on the transportation system by increasing use and maintenance requirements of roads leading to these areas. Tables III-1a, b and c show the estimated number and type of recreational construction by alternative.

Constructing roads; reconstructing roads; maintaining roads; closing roads

Road construction is planned in each alternative to provide access for new facilities, acquired land and for timber management. Road reconstruction will upgrade existing roads to a standard needed for the expected use such as providing suitable access for recreational areas and timber sales. The estimated miles of road construction and reconstruction by alternative are found in Tables III-1a, b and c. All alternatives will provide adequate road maintenance for all open roads. The miles of open roads by alternative are shown in Tables III-1a, b and c. Closing roads will reduce access to certain areas of the forest and reduce road maintenance requirements. Tables III-1a, b and c show the estimated miles of closed roads by alternative. The alternatives' goals and objectives and allocated ROS class reflects the amount of road reconstruction and maintenance. Generally, there is more reconstruction and maintenance in Rural ROS classes and less in semi-primitive motorized classes.

Harvesting trees

The amount of tree harvest will affect the amount of road reconstruction and road maintenance. The higher the harvest level, the more miles of road reconstruction and the more maintenance will be required. The probable amount of road reconstruction by alternative is found in Tables III-1a, b and c.

Other Forest management activities will have little or not affect on the transportation system.

Health, Safety and Energy

Current Condition

Charleston and Berkeley counties have an annual death rate between 5.3 to 7.9 per 1000 population. The leading cause of death is heart disease. The infant mortality rate is 13.8/1000 births in Berkeley county and 12.0/1000 births in Charleston county. Death rates for motor vehicle accidents in 1990 were 47.1/100,000 vehicles in Berkeley county and 26.6/100,000 vehicles in Charleston county (S.C. Budget and Control Board, 1992).

The main areas of energy use in forest management is electrical and motor vehicle fuel consumption. Electrical energy generation in South Carolina is generated by nuclear fuel (60.9 percent), coal (35.5 percent), hydro (3 percent) and oil & gas (0.6 percent). Total electric consumption was approximately 4.3 billion kilowatt hours in Berkeley county and 3.8 billion kilowatt hours in Charleston county in 1990. Vehicle fuel consumption in South Carolina was 1.8 billion gallons of gasoline and 427 million gallons of diesel fuel in 1990 (S.C. Budget and Control Board, 1992).

Environmental Consequences

Effects by Alternative

No activity or alternative is without risk to public health and safety. There are no significant risks in any alternative. Individual projects will have a site–specific analysis to disclose and mitigate any risks or effects.

The effects of the alternatives on energy use were estimated using a model to estimate the British Thermal Units (BTUs) consumed by various forest management practices such as timber harvest, road construction, timber processing, transportation, recreation construction, and recreation operation (Schwarzbart and Llevano, 1982). Activities were estimated for a 100 year period for each alternative, and the cumulative estimated energy consumption was computed. Figure III-17 shows the relative estimated energy consumption by alternative.

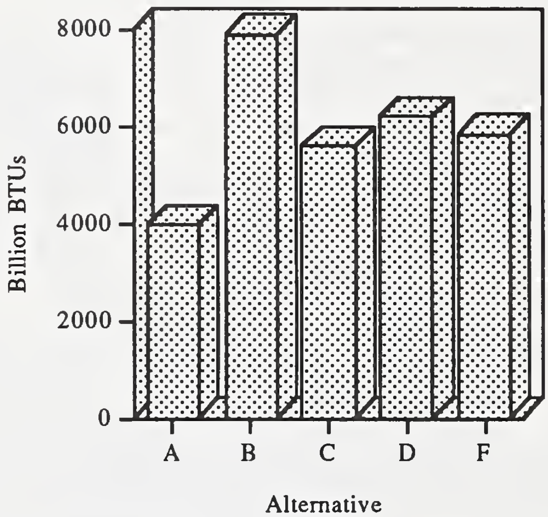


Figure III-17. Estimated energy consumed by alternative over 100 years in billion BTUs.

Effects of Probable Activities

Constructing developed recreational facilities, Maintaining developed recreational facilities, Constructing Trails, Maintaining trails.

Construction will consume energy and pose health and safety hazards inherent in construction activities. More recreational facilities and trails will also increase energy consumption and may increase risk to health and safety with an increase in traffic. Some types of recreational activities may be more hazardous than others. For example, motorized use trails may pose a higher risk to health and safety than non-motorized use trails. The energy consumption would be higher for the more developed areas such as campgrounds and for motorized use trails.

These effects vary by the number, type and capacity of the facilities and trails constructed. Tables III-1a, b and c show the planned construction by alternative.

Maintenance activities consume energy. Poorly maintained facilities may increase risk to health and safety for workers and users. A constant level of maintenance for recreational facilities and trails is common to all alternatives. The estimated number of recreational facilities and capacity by alternative are shown in Tables III-1a, b and c.

Constructing roads; reconstructing roads; maintaining roads; closing roads

Constructing and reconstructing roads consume energy and may lead to increased traffic and subsequent risk to public health and safety.

The magnitude of these effects is determined by the miles constructed or reconstructed and development level of the roads. The estimated miles of road reconstruction by alternative are found in Tables III-1a, b and c.

Maintaining roads will consume energy and affect public health and safety. Well maintained roads will increase the efficiency of user vehicles, subsequently reducing energy consumption. Well maintained roads will also reduce the risk to health an safety of users.

Roads will have a constant level of maintenance in all alternatives. The estimated miles of open roads are found in Tables III-1a, b and c.

Closing roads may pose a higher risk to health and safety by decreasing access for fire fighting. On the other hand, more closed roads may reduce incidence of man-caused fires. The Forest Plan does not make the site–specific determination for road closure, and these effects will be considered at the project level.

The estimated miles of closed roads by alternative are found in Tables III-1a, b and c.

Cross-country motorized vehicle travel

Fewer restrictions on cross-country motorized vehicle travel may result in more visitors engaged in this activity, resulting in more energy consumed and higher risk to public health and safety. As more people are engaged in this activity, the probability of accidents will increase and conflicts may arise with other user groups such as hunters, hikers and bird watchers. The OHV policy comparison by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

These activities will consume energy and will pose minimal risk to health and safety of persons involved in construction and maintenance. Tables III-1a, b and c show the estimate amount of opening construction and total acres by alternative.

Harvesting trees

This activity consumes energy and poses some health and safety risk to workers involved in this occupation. Transportation of wood products to manufacturing facilities pose some risk to public health and safety. Tables III-1a, b and c show the estimated acres of harvest by alternative.

Establishing regeneration

The effects on public health and safety for various treatments to establish regeneration are found in the R-8 FEISVM, pages IV-3-30. The estimated amount of regeneration by alternative is found in Tables III-1a, b and c.

Prescribed burning

As more burning is done, more energy is consumed in activities such as fireline construction, patrolling and managing the burns.

The effects on public health and safety for prescribed burning are found in the R-8 FEISVM pages IV-3-30. More prescribed burning increases the danger of escaped fire and increases risk to public health and safety. The risk of escaped fire is greater in growing season burns. Burning produces smoke which also affects public health and safety. Growing-season burns tend to produce more smoke than winter burns due to high fuel moisture content. Public health and safety also benefits from prescribed burning due to a reduction in forest fuels, which reduces risk of catastrophic wildfire and the smoke generated by wildfire. The estimated amount and season of burning by alternative are found in Tables III-1a, b and c.

Applying herbicides

The effects on public health and safety for herbicide application are found in the R-8 FEISVM, pages IV-3-25 and in the Risk Assessment, pages A1-1 to A5-50. The comparison of the herbicide use by alternative is found in Tables III-1a, b and c.

Timber stand improvement.

The effects on public health and safety for methods of timber stand improvement are found in the R-8 FEISVM, pages IV-3-30. The estimated amount of these activities is found in Tables III-1a, b and c.

Heritage Management Program

Current Condition

Since 1977, approximately 102,000 acres, or 41 percent of the total Forest area, have been inventoried for cultural resources, and more than 1,100 sites have been located and recorded.

Human occupation of lower coastal South Carolina dates back at least 15,000 years as prehistoric people arrived in the area during the last major ice age. While no written records exists for the prehistoric era, abundant archaeological information exist for documenting the centuries of human adaptation to the region.

The historic era began in the early 1500s when European voyages of exploration began along the southeastern coast. Even then, the first century and a half of activity are relatively obscure. However, with the founding of Charles Town in 1670, the area that is now part of the Francis Marion National Forest was granted to the early colonists, and there are numerous historic sites related to early colonization. Evidence of early naval stores industry, plantations, subsistence farming and early industrial sites are found throughout the Forest.

The protection and preservation of archaeological sites and historic buildings are primary concerns, but the resource has potential for scientific use and public interpretation of cultural properties.

The heritage management program identifies significant cultural resources, and manages those resources according to public laws and Federal regulations. This program can provide ideal opportunities to learn about local history and prehistory through visits to historic and prehistoric sites, displays at the Forest visitor's center and Berkeley County Museum, and participation in archaeological excavations.

Environmental Consequences

Effects by Alternative

In all alternatives, all project areas are surveyed before any earth-disturbing activities and require consultation with the State Historic Preservation Organization. Eligible sites are nominated to the *National Register of Historic Places.*

The cultural resources located on the Forest represent an important part of our local, regional and national cultural heritage. Information gathered from cultural resource inventories increases our knowledge of past human activities and life-styles. The more acres of land surveyed in an alternative, the higher the probability of locating new sites.

In all alternatives, it is possible that unplanned events such as wildfire suppression may result in site disturbance.

In all alternatives, significant sites will be interpreted for the public as funding allows and demand exists.

Public use of the Forest may result in cultural resources being destroyed through unintentional damage caused by compaction or ground disturbance. The highest probability for damage to cultural resource occurs in the general forest where surveys have not been conducted.

Alternatives C and D allow cross-country off-highway vehicles to use portion of the Forest that have not been inventoried for cultural resources. Depending on the number of users, type of vehicle and location, the potential risk of damaging cultural resource sites is high.

Alternatives A, B and F do not allow cross country off-highway vehicles in portions of the Forest that have not been inventories for cultural resources and the potential risk to cultural resources is low.

Effects of Probable Activities

Cultural resources are protected under all alternatives. All project areas are surveyed prior to any earth disturbing activities. Cultural resources, both archaeological and structural, are evaluated to see if they meet the criteria for listing in the National Register of Historic Places. Two types of effects on cultural sites can be defined; those which impact the artifacts and features of the site and those which impact site integrity.

Constructing developed recreational facilities; constructing trails; constructing roads; reconstructing roads; cross-country motorized vehicle travel; constructing wildlife openings; harvesting trees; establishing regeneration; prescribed burning; timber stand improvement

All of the above activities involve ground disturbance and have the potential to damage or destroy artifacts and site features. Most of these activities are site specific, and the project area will be inventoried prior to disturbing the ground. One positive effect is that as inventories are made prior to these activities, more sites will be found and knowledge of the cultural heritage increased.

Cross-country motorized vehicle travel is such a wide ranging activity which has a high risk of damaging sites since it is difficult to survey all areas impacted by this activity. It would also be difficult to protect known sites. The OHV policy comparison by alternative is found in Tables III-1a, b and c.

The second type of impact by these activities is damage to site integrity through damage to soils. Two types of effects are involved; surface disruption and soil compaction. Ground-disturbing activities can damage or destroy soil stabilizers such as vegetation, inorganic surface crusts, and natural ground clutter. Constant use of an area will completely disrupt or destroy this stability and cause increased erosion which can remove and destroy all or part of a site. Activities requiring human and machine traffic also cause soil compaction. Compacted soils have a lower infiltration rate, and this results in a higher surface water run-off rate. Compacted soils are also harder to revegetate. The lack of vegetation, combined with the higher run-off rate, creates greater surface disturbance.

Increased looting and vandalism are two of the biggest threats to cultural resources. The amount of vandalism is directly related to the accessibility of sites. A number of instances have been documented of sites being severely affected in areas of high recreational use.

The estimated amount of activities is found in Tables III-1a, b and c.

Maintaining developed recreational facilities; maintaining trails; maintaining roads; maintaining wildlife openings; closing roads

These activities involve ground disturbance. They are usually confined to existing facilities or previously disturbed areas; therefore, they pose little risk of damage to cultural resources.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine; managing hardwood in pine stands; managing transitions and inclusions

These processes include activities and effects discussed previously such as harvesting trees, establishing regeneration, prescribed burning and timber stand improvement.

Charging user fees; applying herbicides

Charging user fees will have little or no affect on cultural resources. Applying herbicides will have little effect since most of the application methods involve little ground disturbance.

Visual Quality

Current Condition

Relatively little federal acreage is visible from major travelways. The Forest is generally flat, and the sight distance is often obscured by heavy vegetation, regenerative areas and storm-damaged areas. No vistas exist, and private lands in agriculture account for most of the breaks in vegetative patterns.

The current Visual Quality Objective (VQOs) classes are listed in Table III-21 displayed in the VQO maps founds on pages III-113 through III-117. The acreages were adopted for the 1985 Land Management Plan but have been updated to more accurately reflect current conditions. The visual inventory is based on landscape variety, viewer sensitivity and viewer distance. Definitions of visual quality objectives are found in chapter 2.

Table III-21. Acres of Visual Quality Objectives allocations.

Visual Quality Objective	Alternative				
	A	B	C	D	F
Modification	109,876	218,270	219,042	204,969	170,466
Partial Retention	101,076	7,166	6,992	7,166	34,483
Retention	18,663	4,179	3,581	17,480	24,666
Preservation	13,812	13,812	13,812	13,812	13,812
Excluded	6,076	6,,076	6,076	6,076	6,076

Environmental Consequences

Effects by Alternative

Most management activities create some natural landscape appearance change. The degree of change acceptable in natural landscapes is guided by Visual Quality Objectives. Generally, the more restricitive the VQOs, are the less impacted the natural landscape appears. Modification is the least restrictive VQO, partial retention is more restrictive, retention is even more restrictive and preservation is the most restrictive.

Common to all alternatives is 13,812 acres of wilderness with a VQO of preservation (6 percent of total acres) and 6,076 acres of areas that were excluded from the inventory and do not have a VQO (2 percent of total acres which includes Santee Experimental Forest).

Alternative A has 44 percent of the Forest in modification, 41 percent in partial retention and 7 percent in retention. With a large portion in partial retention and retention, this alternative appers less impacted by management activities and more natural appearing.

Alternative F has 68 percent of the Forest in modification, 14 percent in partial retention and 7 percent in retention. In this alternative, management activities will be more evident than Alternative A because a larger portion has a modification VQO.

Alternatives B, C and D have similar amounts being visually altered. Management activities in these alternatives will be visually evident in most of the Forest.

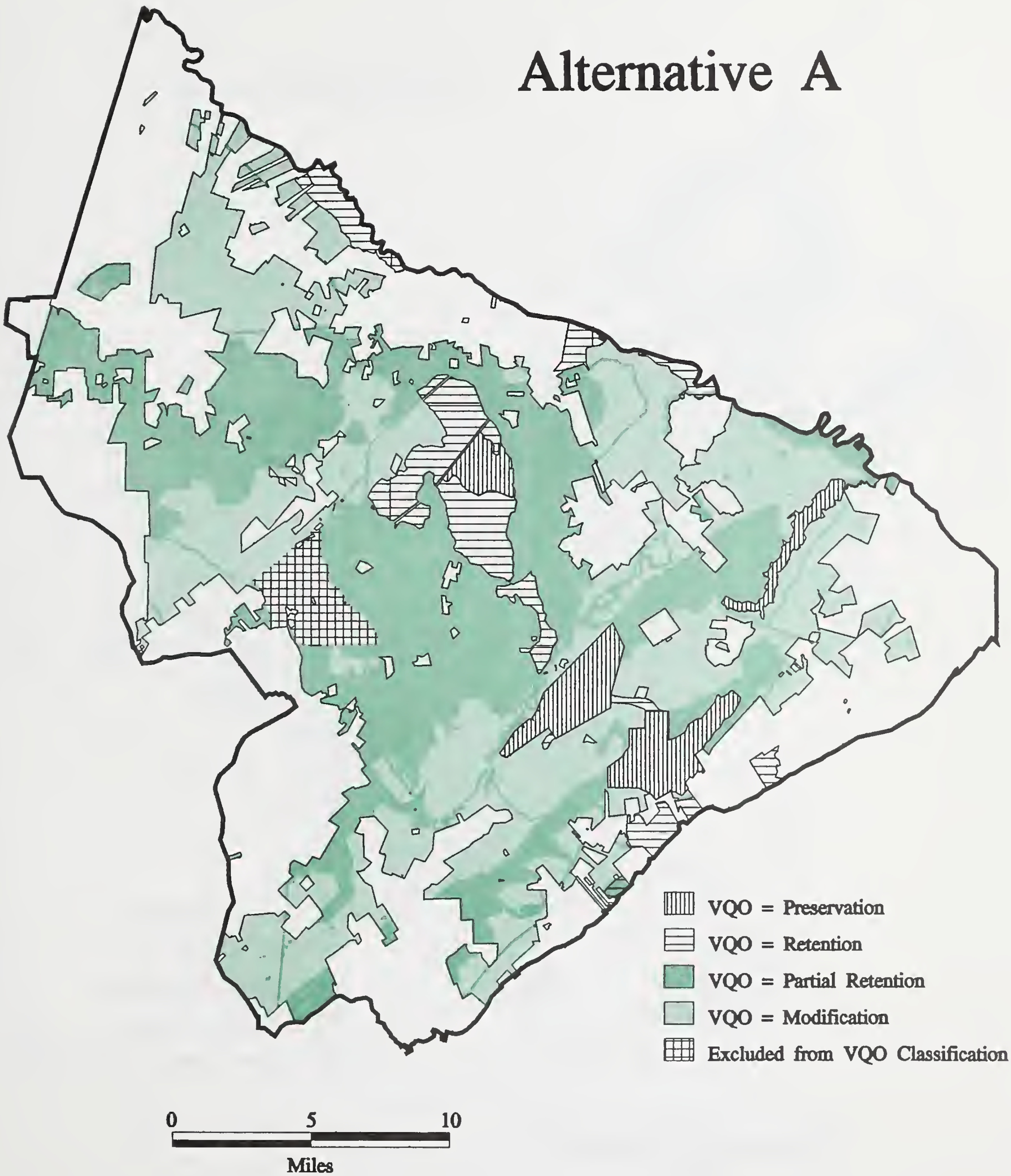
Alternative B has 87 percent of the Forest in modification, 3 percent in partial retention and 2 percent in retention.

Alternative C has 88 percent of the Forest in modification, 3 percent in partial retention and 1 percent in retention.

Alternative D has 82 percent of the Forest in modification, 3 percent in partial retention and 7 percent in retention.

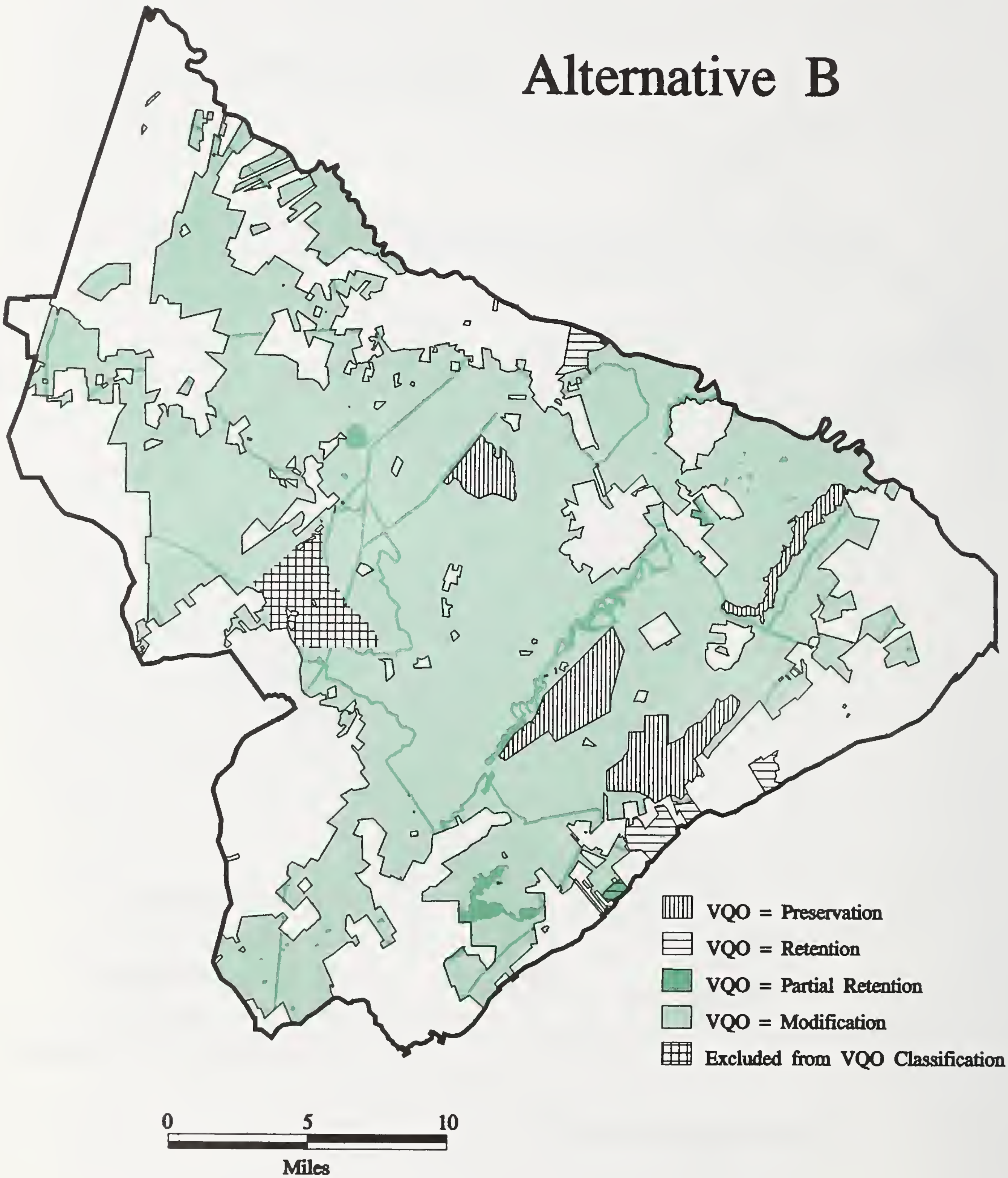
Visual Quality Objectives

Alternative A



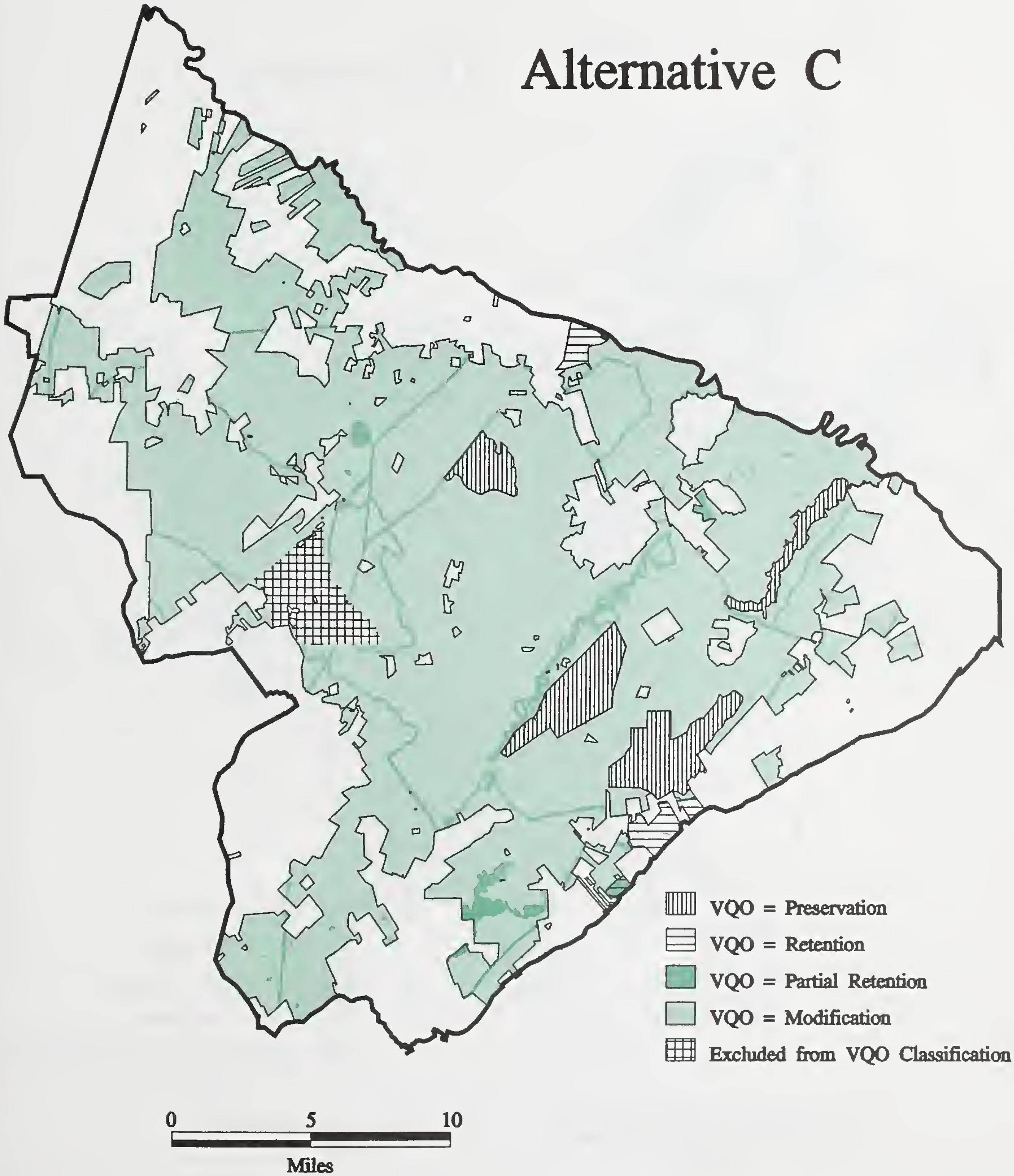
Visual Quality Objectives

Alternative B



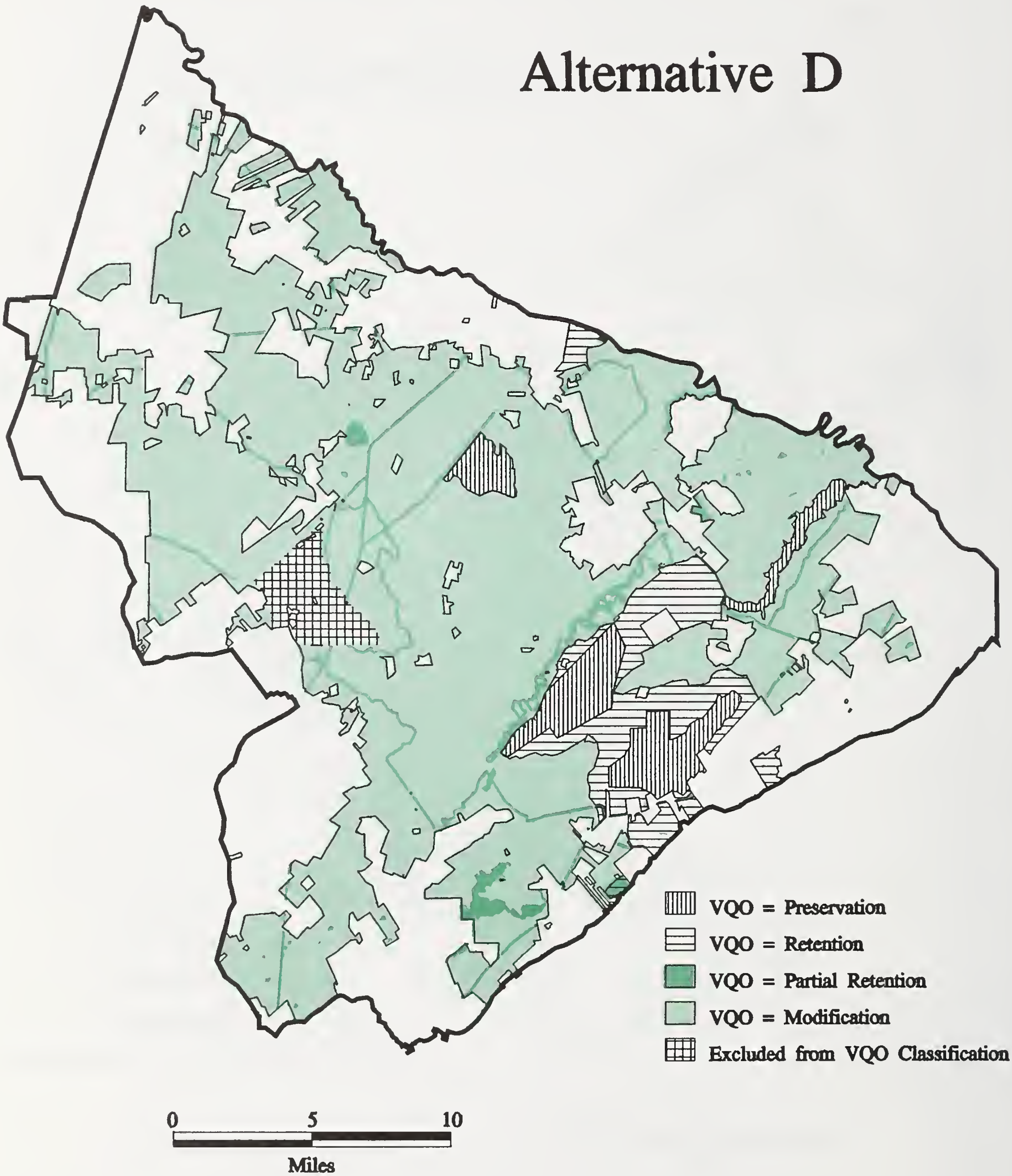
Visual Quality Objectives

Alternative C



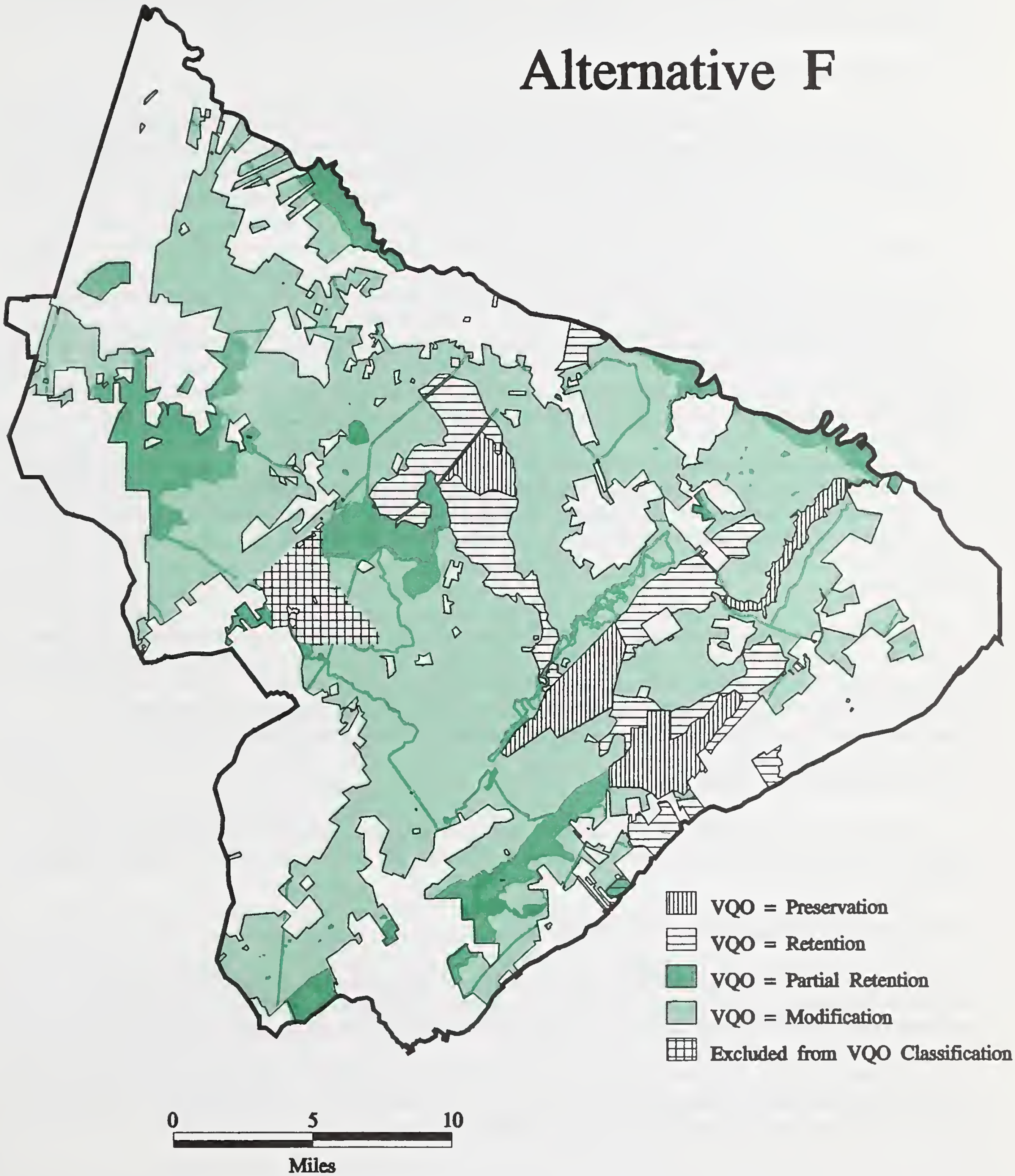
Visual Quality Objectives

Alternative D



Visual Quality Objectives

Alternative F



Effects of probable activities

Constructing developed recreational facilities; maintaining developed recreational facilities

Developed recreational facilities produce a long-term landscape modification. They stand out as an obvious human caused modification of the natural environment. Facilities are designed to blend as much as possible with the surrounding environment. Tables III-1a, b and c show the estimated amount of these activities.

Constructing trails; maintaining trails

The trail system is planned for a variety of uses and experiences, and the effect on the visual quality varies with the use. Generally, the visual impacts are very low with such trails as hiking, canoe, and bicycle. The potential for greater adverse effects occurs with Jeep, OHV and horse trails due to more ground disturbance and increased clearing height and width. Tables III-1a, b and c show the estimated amount of trails by alternative.

Constructing roads; reconstructing roads; maintaining roads

Road construction has the potential to affect visual resource by altering landforms, introducing unnatural lines in the landscape and disturbing vegetative cover. Road construction makes more areas visible.

Roads produce a long-term modification of the landscape. Roads constructed into undisturbed forest changes the long-term visual quality and may also change the visual sensitivity level of an area. Roads designed to conform to the topography, minimize clearing of vegetation, and reduce contrast with the surrounding area will have less visual effects. However, the road still creates an obvious horizontal line which contrast with the surrounding landscape.

Some temporary roads may be built. The visual impact of temporary roads is short term since the intention is to let them grow up in trees and other vegetation after their one-time use. They will be visually evident for 20 years or more to the careful observer but their visual impact will begin to diminish immediately after their intended use. Tables III-1a, b and c show the estimated miles of roads by alternative.

Closing roads

Temporarily closed road have the same affects on visual quality as open roads. Closing roads permanently may improve the visual quality of an area and contribute to a more natural-appearing forest environment. Permanently closed roads that have been revegetated have an effect on visual quality by maintaining a vegetated linear route through the forest that forest users can travel by foot. These corridors are still visually evident for some years because of lack of trees. Tables III-1a, b and c show the estimated miles of closed roads by alternative.

Cross-country motorized vehicle travel

Cross-country motorized vehicle travel affects visual quality by leaving exposed soil and rough surface which contrasts in color and texture with the surrounding vegetative cover. The OHV comparison by alternative is found in Tables III-1a, b and c.

Constructing wildlife openings; maintaining wildlife openings

Due to their small size, irregular shape, permanent location, wide distribution and the diversity of unique vegetation, these permanent openings can improve visual quality as well as offer vistas into the Forest. They provide contrast with an otherwise tree-covered landscape. Some people may like the contrast, while others may not.

Brush piles, exposed soil and stumps may be evident for 1-5 years. Results of maintenance (brush hogging, burning, or hand cutting) are usually noticeable only during the growing season in which they occur. The estimated acres of wildlife openings by alternative are found in Tables III-1a, b and c.

Converting pine stands to mixed stands; converting loblolly pine to longleaf pine

The visual effects of converting pine stands to mixed stands and loblolly stands to longleaf stands have most to do with the method of conversion, intermediate timber treatments and long-term visual effects of resulting stands. The long-term visual effects of a mixed stand include increased visual diversity. The estimated amount of conversions is found in Tables III-1a, b and c.

Harvesting trees

Different harvest methods produce very different visual effects. Visual impacts and disturbances will shift across the Forest over time with some areas actively growing while others are being harvested.

The overall effect on the character of the Forest and effects upon visual resources depend upon the harvest method, location of harvest units relative to viewing areas, overall amount of cutting, and design and layout of harvest units. These are site-specific considerations and are dealt with in site-specific analysis. General effects of harvesting trees are discussed below.

Common to all harvest methods is some vegetative debris, or slash, left from cutting. This debris can be unsightly due to its color and textural contrast. It is particularly noticeable in foreground landscapes. During sale operations, lasting 1-3 years, exposed soil, logging debris and logging equipment will be apparent to forest visitors.

Maintaining natural stand shapes, limiting cutting area size, attention to spatial arrangements, treating residual debris and reserving some standing trees lessen visual impacts within harvest areas. Harvest unit layout can also take advantage of screening vegetation and topography to mitigate some of these visual impacts or improve visual character of an area.

Harvesting can maintain or change the visual appearance of the forest through site disturbances, the breakup of relatively unbroken canopies, and through long-range changes in vegetative and age-class composition. Harvested areas appear rough and for a time look like a disruption in the landscape.

A reduction in visual quality can result from harvesting through removal of vegetation, when harvest areas contrast with adjacent standing vegetation. Natural rapid greening in 1 to 3 years reduces the contrast of the newly cut area. Harvest units can range from a few acres up to 80 acres. The average size is about 40 acres.

Harvests that stagger the removal of the overstory (thinnings, shelterwood, seed tree, single tree selection) have less visual impact than methods such as clearcutting and group selection. Low impact methods would also occur more frequently and could adversely affect visual quality.

The estimated acres of harvest by alternative are found in Tables III-1a, b and c.

Establishing regeneration

The establishment of a new stand of trees may require mechanical site preparation which can be unsightly. The site will remain like this until the stand is either naturally regenerated or planted. In tree planting, rows of trees will be apparent to the viewer. Natural regeneration and randomly planted trees have a more natural appearance. The estimated amount of regeneration by alternative is shown in Tables III-1a, b and c. The effects of various methods of establishing regeneration are further disclosed in the R-8 FEISVM, pages IV-115-116.

Applying herbicides

Herbicides may produce some short-term effects on visual quality by browning target plants treated. As the dead vegetation turns brown, a sharp visual contrast occurs with the adjoining untreated areas. This is particularly noticeable when sites are treated with certain chemicals by broadcast applications. Areas that are treated by spot application or by individual plant treatment present less contrast. The greatest visual effect is during the first year; however, dead standing trees may be evident for several years. The effects will tend to shift around the Forest without accumulating (because of the short-term nature of the effects of the treatment). Effects of applying herbicides are also found in the R-8 FEISVM, pages IV-115-116. The comparison in the herbicide use by alternative is found in Tables III-1a, b and c.

Timber stand improvement

All intermediate treatments tend to provide views into forested stands and increase growth rates on selected trees. Large diameter trees and increased viewing distances can be a visual benefit.

Disturbed soils and logging slash will be evident for a short time but will be softened by residual vegetation. Silvicultural techniques often leave limbs, small trees, and tree tops lying on the forest floor. These may be detract from the natural setting and affect travel through the area. Treatment of slash along visually sensitive corridors will help mitigate these effects. Additional effects of timber stand improvement are found in the R-8 FEISVM, pages IV-115-116. The estimated amount of these treatments by alternative is found in Tables III-1a, b and c.

Prescribed burning

Smoke and short-term blackening of vegetation are the primary visual impacts of prescribed burning. Visual evidence of the burn will usually disappear in 3-4 months. If burned periodically, an area will develop an open, park-like appearance. Some wildflowers are more likely to revegetate in areas that have been recently burned. Burning at certain times of the year will lessen visual impact. The degree of effect would be proportional to the amount and season of prescribed burning accomplished in each alternative. Effects of prescribed burning are also found in the R-8 FEISVM, pages IV-115-116. The estimated acres and season of burning by alternative are found in Tables III-1a, b and c.

Chapter IV

List of Preparers

List of Preparers

A listing of the major preparers (interdisciplinary team) of the draft version of the Francis Marion National Forest Environmental Impact Statement and revised Forest Plan follows. Experience and educational background has been included for these team members. The Forest Management Team and other contributors are also listed.

The Interdisciplinary Team

Richard B. Shelfer—Team Leader

Education	BA Visual Arts, Florida State University; BS Forest Resources and Conservation, University of Florida
Experience	12 years as a forester on 4 National Forests.

Tom E. Berchem—Forester, Lands

Education	BS Forest Management, MS Wood Science and Technology, Southern Illinois University
Experience	4 Years with US Fish and Wildlife Service and 19 years with the US Forest Service as a forester and land specialist on 4 National Forests.

Robbin E. Cooper—Landscape Architect

Education	BLA, Landscape Architecture, Louisiana State University
Experience	2 years community/urban planner in the private sector and 4 years with the US Forest Service as a landscape architect.

Deryl D. Jevons—Public Affairs

Education	BS in Forest and Range Management, Colorado State University
Experience	22 years experience on 5 National Forests in 2 Regions.

Charles W. Kerr—Fire Management Officer

Education	BS in Forest Management, Utah State University
Experience	23 years experience on 9 National Forests in 3 Regions.

Dennis L. Law—Soil Scientist

Education	BS in Soil Science, Florida A&M University
Experience	2 years experience with the Soil Conservation Service, 22 years experience on 3 National Forests

Paul R. Myers—Supervisory Civil Engineer

Education	BS in Civil Engineering, Norwich University, Vermont
Experience	Civil Engineer on national forests in California, Virginia, West Virginia and ten years in South Carolina.

Donald E. Norris—Planning Analyst

Education	BS in Forest Management, Clemson University
Experience	14 years experience on 3 National Forests in 2 Regions.

Robert P. Palazzo—Landscape Architect

Education	BS Degree in Landscape Architecture, Texas A&M University.
Experience	24 years as a landscape architect on 3 National Forests in the Southern Region.

Gail E. White—Editorial Assistant

Education	BA in English, University of South Carolina
Experience	10 years with the US Forest Service

Tony L. White—Silviculturist

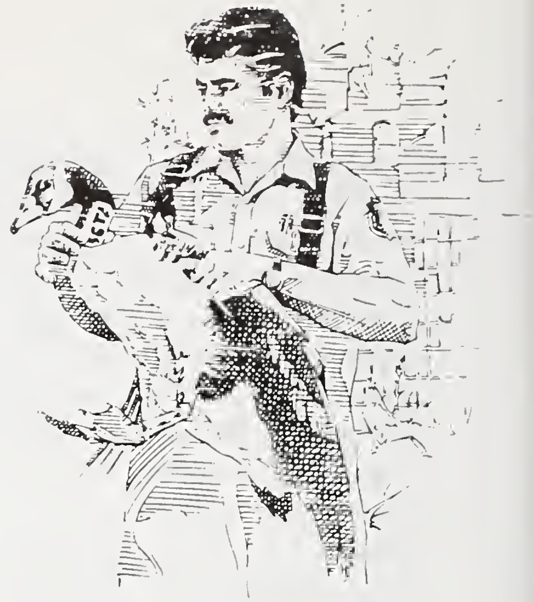
Education	BS in Forest Management, Clemson University
Experience	12 years as a forester on 2 National Forests and the Regional Office.

The Management Team

David W. Wilson—Forest Supervisor
David A. Adams—Administrative Officer
Erin Bronk—Other Resources Assistant
James R. Brotherton—District Ranger, Witherbee
Phyllis C. Burnette—Budget & Accounting Officer
Angela V. Coleman–Public Affairs Staff Officer
Ivan S. Cupp—Fire, Lands and Minerals Staff Officer
William H. Hayes, III—Forest Engineer, Recreation and Cultural Resources
Jerry D. Henderson—Timber, Soil, Water, and Air Staff Officer
Lauren M. Kindred—Timber Management Assistant, Enoree/Tyger Ranger Districts
Dennis L. Law—Soil Scientist
Glen A. Stapleton—District Ranger, Wambaw
Forrest L. Starkey—Acting Program Budget and Planning Staff Officer
Oscar M. Stewart—Wildlife, Fisheries and Ecology Staff Officer

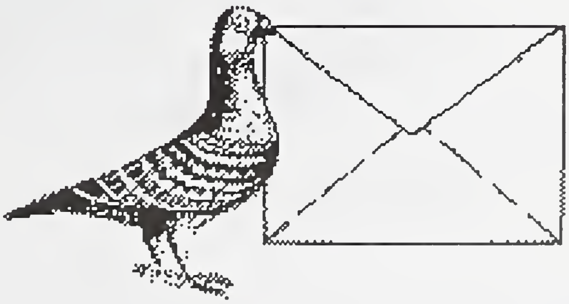
Other Major Contributors

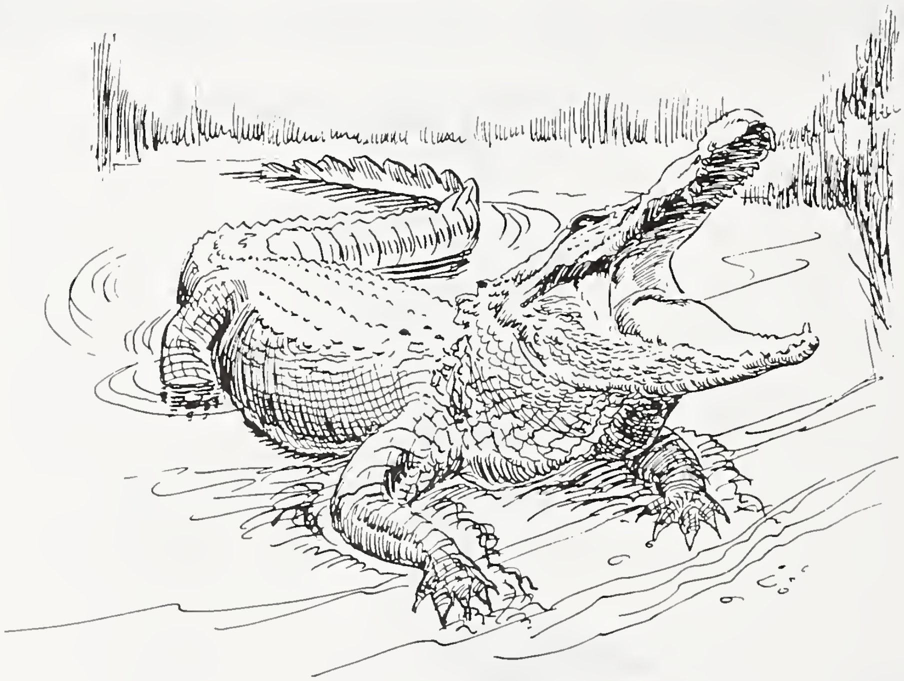
Robert S. Austin—Other Resources Assistant
Patrick J. Barry—Entomologist
Marilyn A. Buford–Research Forester
Danny L. Carlson—Biological Technician
Felicia A. Counts–Clerical Assistant
William S. Craig—Former Recreation and Cultural Resources Staff Officr
Jonathan Dent—Timber Management Assistant
John Y. DuPre—Silviculturist
Donald W. Eng—Former Forest Supervisor
William F. Hansen—Hydrologist
William Jackson—Air Resource Specialist
Dale Jarrell—Fire Management Officer
Elizabeth T. LeMaster—Wildlife Biologist
Alvin R. McDonald— Former Program Budget and Planning Staff Officer
Amy E. Marshall–Clerical Assistant
Robert T. Morgan—Archeologist
Barney Oldfield—Zone Geologist
Gary M. Peters—Wildlife Biologist, Team Leader (2/91–11/91)
Kelly M. Russell—Fisheries Biologist
William F. Twomey—Silviculturist
J. Craig Watson—Wildlife Biologist



Chapter V

Agencies, Organizations and Individuals to whom copies of this DEIS are sent





Agencies, Organizations and Individuals to whom Copies of this DEIS are sent

The *Draft Environmental Impact Statement* for the proposed Forest Plan was distributed to agencies, organizations and individuals as required by National Environmental Policy Act regulations (40 CFR 1502.19). Before releasing for public review and comment, those organizations and individuals on the Forest planning mailing list were notified of the availability of the documents. The organizations and individuals listed below requested copies of the planning documents.

This list is not intended to be complete, but it gives an indication of the number of copies that have been distributed. The complete mailing list is on file at the Forest Supervisor's Office, 1835 Assembly Street, Room 333, Columbia, South Carolina.

Federal Agencies

Agriculture, U. S. Department of

Forest Service

Washington Office

<u>Regional Offices</u>

Region 1–Missoula, Montana
Region 2–Lakewood, Colorado
Region 3–Albuquerque, New Mexico
Region 4–Ogden, Utah
Region 5–San Francisco, California
Region 6–Portland, Oregon
Region 8–Atlanta, Georgia
Region 9–Milwaukee, Wisconsin
Region 10–Juneau, Alaska

<u>National Forests Supervisor's and Forest Manager's Offices</u>

National Forests in Alabama
National Forests in Florida
National Forests in Mississippi
National Forests in North Carolina
National Forests in Texas
Caribbean
Chattahoochee and Oconee
Cherokee
Daniel Boone
Kisatchie
Jefferson
Ouachita
Ozark–St. Francis
Savannah River Forest Station
George Washington

District Offices of the Francis Marion and Sumter National Forest

Andrew Pickens
Edgefield
Enoree
Long Cane
Tyger
Wambaw
Witherbee

Forest and Range Experiment Stations

Southeastern Forest Experiment Station

Environmental Protection Agency
Office of Environmental Affairs

Federal Congressional Delegation

Senator Ernest F. Hollings
Senator Strom Thurmond
Congressman James Clyburn
Congressman Arthur Ravanel, Jr.

Federal Energy Regulatory Commission

Interior, U. S. Department of
Fish and Wildlife Service
Geological Survey

State Agencies

Coastal Council
Dept. of Archives and History
Forestry Commission
Dept. of Health and Environmental Control
Highway Dept.
Governor's Office
Parks, Recreation and Tourism
Water Resources Commission
Wildlife and Marine Resources Dept.

County/City Officials and Agencies

Berkeley County Chamber
Berkeley County Planning Commission
Berkeley County Supervisor
Charleston County Planning Commission
Charleston County Supervisor

Libraries

Berkeley County Public Library
Charleston County Public Library
Colorado State University Library
Richland County Public Library
Georgetown County Public Library
SC State Library
USDA National Agricultural Library

News Media

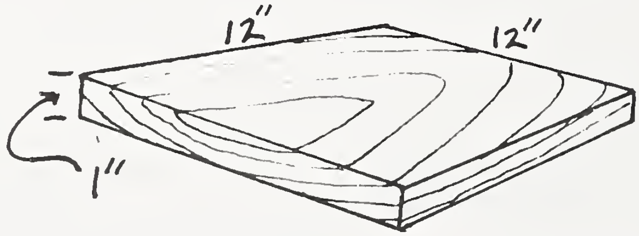
SC Wildlife Magazine

Organizations

Boy Scout Troop 79
National Forest Products Association
National Wildlife Federation
National Wild Turkey Federation
Nature Conservancy
SC Coastal Conservation League
SC Forest Watch
SC Forestry Association
SC Trout Unlimited
SC Wildlife Federation
Sierra Club, South Carolina Chapter
Southern Timber Purchasers' Council

Individuals

A list of individual names to whom copies of this DEIS were sent is on file in the Francis Marion and Sumter National Forests Supervisor's Office, 4931 Broad River Road, Columbia, South Carolina 29210-4021.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Chapter VI

Glossary

Glossary

A

Active Cluster—A specific RCW cluster that is occupied in a given survey year. A cluster is determined to be active when there are nesting or roosting red-cockaded woodpeckers present, or when one or more cavity trees exhibit fresh pitch wells and resin flow, reddish under-bark appearance and/or fresh chipping is present at the cavity entrance.

Administrative Site—Structures and surrounding areas on the Forest including offices, work centers, fire towers, and federally owned residences.

Age Class—One of the intervals into which the age-range of trees is divided for classification or use, usually 10 year increments.

Age Class Distribution—An arrangement or frequency of age classes of trees in a given area.

Affected Environment—The natural, physical, and human-related environment that is sensitive to changes due to proposed actions.

Air Quality Standard— The prescribed level of pollutants in the outside air that cannot be exceeded legally during a specified time in a specified geographical area.

Air Pollution—The presence of contaminants in the air in concentrations that prevent the normal dispersal ability of the air and that interfere directly or indirectly with man's health, safety or comfort or with the full use and enjoyment of his property.

All Terrain Vehicle (ATV)—A vehicle characterized by its ability to negotiate most kinds of terrain by virtue of traction devices such as wide tracts, large, low-pressure rubber tires, and/or all-wheel drive.

Allowable Sale Quantity (ASQ)—The quantity of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the Plan.

Alluvial—Clay, silt, sand, gravel or similar detrital material deposited by running water such as soil formed in flood plains.

Alternative—A proposition or situation offering a choice between two or more management methods, only one of which may be chosen.

Analysis Area—An aggregation of like capability areas; each analysis area contains all capability areas with similar physical, biological and administrative conditions. Analysis areas consist of a collection of land areas of sufficiently similar character to be treated as if they were identical.

Analysis of Management Situation (AMS)—A determination of the ability of the planning area to supply goods and services in response to society's demand for those goods and services.

Anaerobic—Living, active, or occurring in the absence of free oxygen.

Anadromous Fish—Those species of fish that mature in the sea and migrate into streams to spawn.

Annosum Root Rot—A disease that affects conifers and is caused by the fungi pathogen, *Heterobasidion annosum.* It is often spread by airborne spores to the stumps of freshly cut stumps and will spread to nearby trees through the roots. Infected trees are often leaning or completely uprooted while still alive due to the decay of support roots.

Anthropogenic—Condition induced or altered by the presence and activities of man.

Aquifer—Water bearing underground strata.

Aquatic—Pertaining to standing and running water in streams, rivers, lakes and reservoirs.

Arterial Road—A road which provides service to large areas and usually connects with public highways or other Forest arterial roads to form an integrated network of primary travel routes.

Atmospheric Carbon—Carbon in a gaseous state found in the mass of air surrounding the earth. (Carbon (C) is a nonmetallic element which is found in all living matter.)

B

Basal Area—The cross-sectional area (square feet at 4 1/2 feet above ground level) of trees occupying an acre of land. Basal area is used to measure the density of a stand of trees.

Bedding—Method of site preparation which plows, mixes and loosely piles topsoil and litter into elevated beds. Normally done on wet sites to improve soil drainage.

Benchmark—An analysis reference point of the maximum physical/biological capability to produce a resource yield from Forest lands while maintaining minimum legal requirements for production of other resources and maintenance of soil and water productivity. Benchmarks define the area within which alternatives can be formulated.

Best Management Practice (BMP)—A practice or a combination of practices that is determined to be the most effective and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals.

Between-Stand Spacial Diversity—The spacial distribution, arrangement and abundance of different plant and animal communities and species at a multi-stand level.

Biennial—occurring every two years.

Biochemical—characterized by, produced by, or involving chemical reactions in living organisms.

Biodiversity—The variety of life in an area, including the variety of genes, species, plant and animal communities, ecosystems, and the interaction of these elements.

Black Turpentine Beetle—*(Dendroctonus terebrans)*, a forest pest belonging to a group known as pine bark beetles. They often kill pine trees by tunneling and feeding within the soft inner bark of pine trees.

Blue Stain Fungi—A group of fungi predominantly from the genus *Ceratocystis*. These fungi cause wood discoloration, primarily the sapwood, but seldom cause decay. The stains range from grayish through dark blue to blackish.

Board Foot—A unit of timber measurement equaling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long and 12 inches wide.

Bole—Generally refers to the stem portion of trees. The portion from the ground to the canopy, i.e., trunk.

Botanical Areas—An area which has been classified for special management by the Forest Service as containing specimens or group exhibits of plants, plant groups and plant communities which are significant because of form, color, occurrences, habitat, location, life history, arrangement, ecology, environment, rarity and/or other features.

Brood Habitat—An area which provides food, water, cover, and space for young animals to live.

Brown Spot Needle Blight—A serious disease affecting longleaf pine caused by the fungus *Scirrhia acicola*. Young, grass stage seedlings are particularly vulnerable to severe infections and may die or experience stunted growth.

Browse—Leaf and twig growth of shrubs, woody vines and trees available for animal consumption, usually based on the current year's growth.

Buffer-Filter Strip—A designated land area, along the perimeter of some land use, whose own use is regulated so as to resist, absorb, filter or otherwise preclude or control unwanted development, material or other intrusions into areas beyond the buffer.

Burning Regime—A planned program of prescribed fire in which an area is burned periodically according to a scheduled cycle.

C

Canopy—The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Capability Areas—Discrete and recognizable units of land or water classified according to the physical, biological and the administrative conditions of the area units. They are homogeneous in their ability to produce resource yields and also their production limitations.

Carbon Dioxide CO_2—A colorless, odorless, non-poisonous gas that is a normal part of the ambient air. CO_2 is a product of fossil fuel combustion, and some researchers have theorized that excess CO_2 raises atmospheric temperatures.

Carnivorous Plant—A plant that traps animals, primarily insects, and uses the nutrients.

Cavity Nester—Wildlife species that excavate and/or occupy cavities in trees and snags.

Cavity Tree—A tree that contains a red-cockaded woodpecker cavity or start hole.

CFR—Code of Federal Regulations.

Clearcutting—The removal, in a single cut, of all trees in a stand.

Closed Road—A road which is permanently or periodically closed to motorized vehicle travel.

Collector Road—A road which serves smaller land areas than an arterial road and is usually connected to a Forest arterial road or public highway.

Cluster or Cluster Site—A site in which a clan of red-cockaded woodpeckers nest or roost. It includes the total number and area of cavity trees plus at least a 200-foot zone around them.

Commercial Forest Land (CFL)—Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity or watershed conditions; and (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained within five years after final harvesting.

Commodity—A tangible or physical yield, such as timber, forage, minerals, water, etc., synonymous with RPA's "Market."

Compartment—An administrative unit of land comprised of several stands and ranging in size from 1,000 to 2,000 acres.

Constant Service Road (Constant entry road)—A road developed and operated for continuous or annual recurrent service.

Constraints—Limitations; things which cannot be done or things which must be done.

Consumptive Use—Those uses of a resource that reduce its supply, such as timber harvesting or fishing.

Continuous Inventory of Stand Condition (CISC)—A computerized data base used by forests in the Southern Region to store stand condition data such as forest type, acres, age stocking level, work needs and similar stand attributes.

Conversion—A change from one tree species or community of species to another.

Corridor—A narrow strip of land, usually for location of transportation or utility rights-of-way within its boundaries.

Cost Effective—Achieving a specified level of yields while minimizing cost, subject to constraints.

Cost Efficient—Achieving a specified level of yields while maximizing net benefit, subject to constraints.

Council on Environmental Quality (CEQ)—An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies and advises the President on environmental matters.

Crown Closure—Percent of tree canopy closure.

Cubic Foot (CF)—The amount of timber equivalent to a piece of wood having dimensions of one foot by one foot by one foot.

Culmination of Mean Annual Increment (CMAI)—The age at which the average annual growth is greatest for a stand of trees. Mean annual increment is expressed in cubic foot measure and is based on expected growth according to management intensities and utilization standards assumed in accordance with 36 CFR 219.16(a)(2)(i) and ii).

Cultural Resources—The remains of sites, structures, or objects used by humans in the near (historical) or distant (archaeological) past.

Cumulative Impact (Effect)—The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)

Current Management—Management of Francis Marion National Forest under existing standards and guidelines with annual yields and costs based upon the average outputs and costs for fiscal years 1980, 1981, and 1982.

D

DBH (Diameter Breast Height)—Diameter of a tree approximately 4 1/2 feet above the ground.

Demand—The amount of a good or service that users would be willing to take at a specified price, time period, and condition of sale.

Desired Future Condition—An expression of resource goals that have been set for a unit of land. It is written as a narrative description of the landscape as it will appear when the goals set for it have been achieved. It includes a description of physical and biological processes, the environmental setting and the human experience.

Developed Recreation—Recreation that requires facilities and results in concentrated use of an area. Examples are campgrounds and picnic areas.

Direct Effects—Effects which are caused by an action taken and occur at the same time and place as the action.

Dispersed Recreation—Recreation outside of developed recreational facilities. Examples are hiking and driving for pleasure.

Diversity—The distribution and abundance of different plant and animal communities and species within the planning area.

Dormant Season—A period in which certain plant species exhibit a special condition of arrested growth in which the plant and such plant parts as buds and seeds do not begin to grow without special environmental cues such as photo period.

Draft Environmental Impact Statement (DEIS)—A draft version of the Environmental Impact Statement which must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines and directives of the agency responsible for the project proposal.

E

Early Forest Succession—The biotic community that develops immediately following the removal or destruction (e.g., from wildfire) of the vegetation in an area. This habitat is characterized by an abundance of grasses, brush and forbs. A forest canopy is generally not present but some scattered trees may offer partial shade.

Ecological Classification System—A hierarchical system used to help organize and coordinate the classification of ecological types and ecological units and to make comparisons. Classification is ecologically based and integrates existing resource data such as climate, topography, geology, soil, hydrology, and vegetation. The system includes many levels (from a top down approach): domain, division, province, section, subsection, landtype association, landtype, landtype phase, and site.

Ecological Management Unit—A unit of soil classification that describes the landform, soil texture, water regime, certain behavior patterns of soils (pans, sand-cap, etc.) and key modifiers (soils that are extremely acid, shallow in depth, sodium, etc.)

Ecology—The science of the interrelationships between organisms and their environments.

Economic Dependency—The percentage of income and employment that is associated with the basic economy. It can be expressed in total or by market sectors.

Economic Diversity—The number of market sectors in an area and the distribution of economic activity within these sectors. The economic activities used to define economic diversity include total income, employment, exports, final demand, value added and industrial output.

Economic Efficiency—A measure of how well inputs are used to achieve yields when all inputs and yields (including environmental) are identified and valued. It is usually measured by incremental present net value. Other measures, such as benefit/cost ratio, or rate of return may be used.

Ecosystem—The sum of the plant community, the animal community and environment in a specified area. This includes all living and non-living things and the processes associated with these components. Ecosystems are characterized by composition, structure and process. Humans are a part of the ecosystem.

Ecosystem Management—The use of an ecological approach to achieve the multiple-use management of national forests and grasslands by blending the needs of people and environmental values in such a way that national forests and grasslands represent diverse, healthy, productive, and sustainable ecosystems.

Edge—Where plant communities meet or where successional stages of vegetative conditions within plant communities come together, e.g., forest and meadow.

Emission—A discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into air.

Endangered Species—Any species which is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA)—A law requiring federal agencies to conserve endangered and threatened species, and strictly prohibits any person from harassing or harming any listed species. It also requires federal agencies to develop information about the potential impacts of proposed actions on a listed species before the agency commits itself to a particular course of action.

Environmental Assessment (EA)—An analysis of all actions and their predictable short and long-term environmental effects, which include physical, biological, economic and social factors and their interactions. Also, a concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act of 1969.

Environmental Effect—An environmental consequence as a result of a proposed action. It includes both direct and indirect effects.

Environmental Impact Statement (EIS)—A formal document which must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines and directives of the agency responsible for the project proposal.

Erosion—The wearing away of the land's surface by forces such as running water, wind, ice or geological agents. It includes detachment and movement of soil or rock fragments by water, wind, ice or gravity.

Escape Cover—A portion of the habitat which provides refuge for animal species and protects them from harassment and predation.

Escaped Fire—A fire which has exceeded, or is anticipated to exceed, pre-planned initial action capabilities or the fire management direction.

Estuaries—Areas where the fresh water meets salt water.

Even-Aged Timber Management—The combination of actions that results in the creation of stands in which trees of essentially the same age grow together.

Exotic—Refers to a non-native or introduced plant or animal species.

Extirpation—A species that is being removed from a geographical portion of its original range; the species still exists, but its range is now much smaller.

F

Facility—A single or contiguous group of improvements that exists to shelter or to support Forest Service programs.

Fauna—The animals of a given region or period.

Federal Register—The designated document that notifies the public of federal actions and includes such things as Notice of Intent, calls for public involvement, etc. This document also publishes the regulations needed to implement those federal actions.

Feral—Animals that have reverted from domestication to a wild state.

Final Environmental Impact Statement—The document that follows a draft environmental impact statement and contains analysis regarding forest programs that will have a significant impact on the environment.

Fire Dependent Species/Fire Dependent Community—Species or communities of animals or plants that depend on fire to grow, reproduce, and maintain their population.

Fire Intensity Level—A term describing fire behavior based on flame length and heat generated by fire in BTU/Sec-Ft used in estimating fire suppression requirements and fire effects on resources.

Fire Lines—A linear barrier used to stop prescribed burns and wildfires by the removal or treatment of fuels. Fire lines may include the use of mechanically plowed lines, water, retardants, etc.

Fire Regime—See Burning Regime

Floodplain—Low land and relatively flat areas joining inland and/or coastal waters. The minimum area included is that subject to a one percent (1OO-year recurrence) or greater chance of flooding in any given year. Executive Order (EO) 11988 provides direction in the management of these areas to avoid losses of life, property, wildlife or other beneficial values.

Flora— The plants of a given region or period.

Forage—The vegetation that is eaten by wildlife species.

Forb—Any herbaceous plant other than grass or grass-like plants.

Forest Fragmentation—The condition of isolated forested habitats that adheres to the principles of island biogeography (also known as insular ecology). It can be described in terms of patterns of alternate land uses which separate forest patches such as croplands, pastures, power line rights-of-way, highway corridors, and other non-forest habitat. Three primary factors which interact to determine whether a forest is subject to fragmentation are patch size, isolation and total forest reserve which are in the system. Habitat fragmentation is a relative term which must be associated with a particular habitat and species.

Forest Land—Land at least 10% occupied by forest trees of any size, or formerly having had such tree cover, and not currently developed for non-forest use.

Forest Plan—A plan which gathers and coordinates the direction to be followed in the overall management of the National Forest.

Forest Type/Cover Type/Stand Type—A classification of forest land based upon the tree species with the most live tree crown dominance.

FORPLAN—A linear programming model used to facilitate analysis of the alternatives.

Fuels—Living or dead plant material that will burn when weather conditions are correct.

Fuel Loading—An estimate of the entire accumulation of vegetative matter on a given area, expressed in tons per acre.

Fuel Model—A mathematical expression of fire fuels used in estimating wildfire or prescribed fire behavior.

Fusiform Rust—A common forest pest caused by a fungus *(Cronartium quercuum* f. sp. *fusiforme)*. This disease primarily affects loblolly and slash pine and can be effectively controlled with fungicides.

G

Game—The species of wild animals that are hunted, fished or trapped.

Genetically Improved—Most often referred to in terms of pine seedlings grown in seed orchards or nurseries that have been genetically altered to enhance certain features such as pest resistance.

General Forest Area—An area in which no single resource is singled out for emphasis.

Geographic Information System (GIS)—An information processing technology to input, store, manipulate, analyze, and display spatial resource data to support the decision making processes of an organization. Generally, an electronic medium for processing map information, typically used with manual processes to effect specific decisions about land base and its resources.

Goal—A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed. (36 CFR 219.3)

Goods and Services—The various outputs, including on-site uses, produced from forest resources.

Growing Season Burns—Prescribed burns conducted from the early spring to late summer, the growing season of most plants.

Guideline—A preferred course of action. Guidelines promote the achievement of Forest Plan goals and objectives in a manner that permits operational flexibility to respond to variations such as changing site conditions or changed management circumstances.

H

Habitat—The physical and biological environment of a plant or animal where all essentials for its development, existence and reproduction are present.

Habitat Linkages—Corridors of lands connecting similar wildlife habitat areas.

Habitat Management Area (HMA)—The desired future demographic configuration of a red-cockaded woodpecker population. It is an area dedicated to RCW management.

Hardwoods—Broad-leaved and deciduous trees.

Harvests—The cutting and removal of trees from a forest.

Herbicide—A chemical compound used to kill or control growth of selected plant species.

Hunt Camp—A dispersed recreation site with rustic or minimum facilities normally used by hunter, etc.

Hydric Soils—Soils which are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper region of the soil.

I

IMPLAN—A computer-based system used by the Forest Service for constructing non-survey input-output models to measure economic input.

Improvement Cut—Cutting that adjusts species composition, tree quality or stand health in stands which are older than the sapling stage.

Inactive Cluster—A cluster site where there are no red-cockaded woodpeckers present and when none of the cavity trees exhibit active resin wells. Active resin wells are noted by recent pecking and clear, fresh resin flowing form the well, reddish under-bark appearance or fresh chipping of cavity entrance or plate.

Inclusions—A community of trees and other plants with all the attributes of a stand, but not meeting minimum stand size or shape criteria.

Indirect Effects—The effects which are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable.

Insectivorous Birds—Birds whose primary diet consists of insects.

Interdisciplinary Team (ID Team)—A group of individuals with skills from different resources assembled to identify and resolve issues and problems.

Interim Standards and Guidelines for the Protection and Management of the Red-cockaded Woodpecker Habitat within 3/4 Mile of Cluster Sites—Red-cockaded woodpecker management issued May 9, 1990–The guidelines updated the direction found in the "1985 Recovery Plan" and is in effect until the EIS for RCW management is finalized.

Intermediate Stand Treatment or Harvest—Any removal of a portion of the trees from a stand between the time of its formation and the regeneration cutting.

Intermittent Service Road—A road developed and operated for periodic service and closed for more than one year between periods of use.

Interpretive Sites—A site at which a broad range of natural or cultural phenomena is interpreted or described for the enjoyment of the public.

Intertidal Drainages—Areas between high and low water levels that flow off gradually.

Intolerant Species—Those plant species that do not grow well in shade.

Invertebrate Species—Animals that are lacking a spinal column. Most Forest connotations deal with insect populations.

Ips Beetle—A forest pest that inhabits most pine species. These beetles (*Ips avulsus, Ips grandicollis, Ips calligraphus*) can be controlled by avoiding injury to trees, remove beetle-infested trees, and spray nearby trees with approved insecticide.

Irretrievable—Applies to losses of production, harvest, or use of renewable natural resources.

Irreversible—Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long time periods; also includes loss of future options.

Issue—A subject or question of widespread public discussion or interest regarding management of National Forest system lands.

K

Key Area—Areas of land which supplement specific habitat requirements (food, water or cover).

L

Late Succession—A stage of forest development where the majority of trees are mature or over mature.

Landform—Any physical, recognizable, form or feature of the earth's surface having a characteristic shape and was produced by natural causes.

Landtype—An intermediate level in the ecological classification system based on landform, natural vegetative communities and soils.

Landtype Association—A group of landtypes. The landtypes in the associations are sufficiently homogeneous to be considered as a whole for modeling the future outputs and effects of planned management activities. Landtype Associations may not follow watershed boundaries and are defined on the basis of general similarities in geology, climate, landform and vegetation.

Legume—A simple, dry, dehiscent, podlike fruit which splits along two seams, as a pea pod.

Linear Programming—A mathematical technique for determining the effects of alternatives on resource allocation.

Local Road—These roads connect terminal facilities (log landings, skid trails, recreational sites, etc.) with Forest collector or Forest arterial roads, or public highways.

Long-term Effects—Those effects which generally occur after 20 years.

Long-term Sustained Yield Capacity—The highest uniform wood yields from lands being managed for timber production that may be sustained under a specified management intensity, consistent with multiple use objectives.

Low Human Disturbance—Areas where timber harvesting, prescribed burning and other management methods are allowed but are of a lower magnitude than the general forest area. Road density is generally less than the general forest area.

Low Impact Recreation—Recreation activities which have little or no effect on the natural environment such as hiking, bird watching, etc. Generally, dispersed recreational activities have a lower impact than developed recreational activities.

M

Management Area—Areas of the Forest with similar management objectives where compatible prescriptions are applied.

Management Attainment Report (MAR)—An annual accomplishment report of budgeted and targeted items required by Forest Service Policy.

Management Concern—A matter of importance to the management of the National Forest system lands, which is identified internally by the agency.

Management Direction—A statement of multiple use and other goals and objectives, the management prescriptions and the associated standards and guidelines for governing them.

Management Emphasis—The multiple use values to be featured or enhanced.

Management Indicator Species—A particular type of plant or animal whose presence in a certain location or situation is a fairly certain sign or indication that particular environmental conditions are also present.

Management Prescription—Management practices selected and scheduled for application on a specific area to attain multiple use benefits and other goals and objectives.

Management Team—Decision-making group consisting of the Forest Supervisor, Staff Officers, District Rangers and Forest staff.

Mast—The fruit of all flowering plants utilized by wildlife. Soft mast includes fruits with fleshy exteriors such as berries, drupes, and pomes and is represented by plants such as cherries, dogwoods, hollies, mulberries, blackberries, and blueberries. Hard mast includes fruits with dry or hard exteriors such as achenes, nuts (includes acorns), samaras, cones, pods, seeds, and capsules. Examples include oaks, hickories, pine, yellow poplar, beech, honeylocust, hornbeams, hazelnuts, legumes, and grasses.

Maximum Modification (VQO)—A visual quality objective meaning man's activity may dominate the characteristic landscape.

Mean Annual Increment—The average annual growth of a tree, calculated by dividing the total growth it has accrued over its life by its age in years at the time of measurement.

Mid-story—A middle canopy layer of smaller trees that occur under an overstory of trees. These trees are usually of a different species than the large trees and can grow in almost total shade.

Mitigation—Actions taken to avoid, minimize, reduce, eliminate or rectify the impact of a management practice.

Mixed Stands—A stand which is made up of more than one tree species. A mixed stand would have no single species comprising more than 70% of the total stand.

Modification (VQO)—A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture.

Monitoring and Evaluation—Collecting information, generally on a sample basis, to determine how well Forest Plan goals and objectives have been met. Evaluation asks the questions, "Did we do what we said we would?" "Did the project/activity work?" "Are initial Plan assumptions valid?"

Multiple Use Management—The management of all the various renewable surface resources of the National Forests so that they are utilized in the combination that will best meet the needs of the American people.

N

National Environmental Policy Act (NEPA) of 1969—An Act to declare a National policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council of Environmental Quality.

National Forest Management Act (NFMA)—A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Regional Guides and Forest Plans, and the preparation of regulations to guide them.

National Register of Historic Places—A listing maintained by the National Park Service of areas which have been designated as being of historical significance.

Native Species—A plant or animal species inherent to an area.

Natural Regeneration—The renewal of a forest stand by natural means, or without efforts to seed or plant trees. The new trees grow from self-sown seeds or by vegetative means such as root suckers.

Neotropical Migrants—North American birds that migrate to the neotropics (South America, Central America, and Caribbean) during the winter but nest in North America.

Net Public Benefit (NPB)—The overall value to the nation of all yields and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index.

Net Value Change (NVC)—(Also Net Resource Value Change). The sum of the changes in resource values on a land area that results from increases (benefits) and decreases (damages) in resource outputs as a consequence of fire.

Net Worth— Net monetary income.

Nitrogen-fixing Plant—Plants which convert atmospheric nitrogen into nitrogen compounds which are available to green plants.

Nonchargeable Volume—All volume that is not included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity.

Non-commercial Forest Land—Forest land which is incapable of producing crops of industrial wood or has been designated as Unsuitable for Timber Production.

Non-consumptive Use—That use of a resource that does not reduce its supply such as boating and swimming.

Nongame Species—Animal species that are not usually hunted, fished or trapped.

Non-Price Yields—Those yields for which there is no available transaction evidence and no reasonable basis for estimating a market value commensurate with market values associated with price outputs.

Nondeclining Yield—A timber flow constraint which ensures that harvests in each period after the first will be greater than or equal to the harvest in the preceding period.

Non-forest Land—Lands never having or incapable of having ten percent or more of the area occupied by forest trees, or lands previously having such cover and currently developed for non-forest use.

Non-point Source Pollution—Pollution whose source is general rather than specific in origin.

Not Appropriate for Timber Production—Lands that (1) are proposed for uses which preclude timber production, (2) other objectives limit timber production on so that the minimum management requirements in CFR 219.27 cannot be met, or (3) are not cost-efficient in meeting Forest objectives over the planning horizon. [36 CFR 219.14(c)]

Not Suited (Unsuitable) for Timber Production—Includes lands which are (1) Not forest land, (2) Technology not available to ensure timber production without irreversible resource damage to soils productivity, or watershed conditions, (3) No reasonable assurance that land can be adequately restocked within 5 years of harvest, and 4) Land has been withdrawn from production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service. [36 CFR 219.14(a)(b)]

Notice of Intent—A notice printed in the Federal Register announcing that an Environmental Impact Statement will be prepared. (40 CFR 1508.22)

Nutrient Displacement—The movement of organic matter and nutrients off site by mechanical means.

Nutrient Leaching—The movement and subsequent loss of nutrients through the soil.

O

Objective—A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (36CFR 219.3)

Objective Function—The item to be maximized (or minimized) in the problem's solution.

Obliteration—(Relative to roads). To remove all traces, indications, and significance of.

Off-site Tree Species—Pertains to any tree or trees that have been planted or naturally seeded onto a site that historically had other tree species present.

Old Growth—Forest ecosystems distinguished by old trees and related structural attributes. Specific attributes vary according to Forest type, climate, site conditions and disturbance regime.

Opportunity Costs—The value of the most economic use for an input that is foregone by using it differently in a given alternative.

ORV (Off-road vehicle)—Any vehicle capable of traveling over land where no road exists.

Outputs—The goods, services, and products which are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. Also goods, end products, or services that are purchased, consumed or utilized directly by people.

Overstory— Trees which over-top the other trees.

P

Pales Weevil *[Hylobius pales* (Herbst)]—Weevil in which larvae feed primarily on pine reproduction in cutover pine land. Most serious insect pest of pine reproduction.

Palustrine—Living or thriving in a marshy environment.

Partial Cut—A variety of silvicultural practices where a portion of the stand is removed and a portion is left.

Partial Retention—A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

Perennial Stream— Surface waters that flow throughout the year; receive water not only from precipitation, but also from underground sources at springs and seeps and owe their permanency to the ground water in the area adjoining the stream being at a higher elevation than the stream bed.

Pests—Any animal or plant that during some portion of its life cycle, inhibits the establishment or growth of some other species of plant or animal favored by man. Also refers to those insects and diseases that can be detrimental to achieving resource management objectives.

PETS Species—An acronym for proposed, endangered, threatened or sensitive plant, or animal species for listing pursuant to the Endangered Species Act.

People-At-One-Time (PAOT)—A recreation-capacity measurement term indicating the number of people that can comfortably occupy or use a facility or area at one time.

Photosynthesis—The conversion of light energy to chemical energy; the production of carbohydrates from carbon dioxide in the presence of chlorophyll by using light energy.

Physiognomy—External aspect or characteristic.

Physiographic region—An area of land having a particular pattern of landforms that differ significantly from adjacent areas.

Pine Sawfly (*Neodiprion* sps.)—Species of sawflies which primarily feed on the needles of conifers, sometimes causing complete defoliation and mortality.

Pine Stand—A stand of trees in which 70 percent or more of the dominant and co-dominant crowns are pine species.

Pine Tip Moth (*Rhyacionia frustrana* [Comstock])—Moths whose larvae feed primarily on the tips of young pine trees except the longleaf pine causing reduced height growth, poor form, and occasionally death.

Pine-Hardwood Stand—A stand of trees in which 51 to 69 percent of the dominant and co-dominant crowns are pine.

Planned Ignition—A fire started by a scheduled, deliberate management action.

Planning Horizon—The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions.

Planning Period—One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits. (36 CFR 219.3)

Planning Process—The regulations as established in 36 CFR 219 for developing, adopting, and revising land and resource management plans for the National Forest System as required by the Forest and Rangeland Renewable Resources Planning Act of 1974 as amended by the National Forest Management Act of 1976.

Plant Communities—An association of plants of various species found growing together in different locations with similar site characteristics.

Potable Water—Water suitable for drinking or cooking purposes from both health and aesthetic considerations.

Potential Yield— The maximum possible harvest during the lO-year plan period under intensive management on regulated land.

Precommercial Thinning—The selective felling or removal of trees in a young stand prior to commercial thinning.

Predator—An animal species that obtains its food by hunting other animal species.

Preferred Alternative—The alternative recommended for implementation as the Forest Plan.

Prescribed Fire—A wildland fire burning under pre-planned, specified conditions to accomplish specific planned objectives. It may result from either a planned or unplanned ignition.

Prescription—Management practices selected and scheduled for application on a specific area to attain goals and objectives.

Present Net Value—Discounted benefits less discounted costs associated with providing all yields to which monetary values can be assigned.

Preservation (VQO)—A visual quality objective that allows for natural changes only.

Priced Yields—Those yields which are or can be exchanged in the market place.

Primitive ROS Class—A classification of the recreation opportunity spectrum characterized by an essentially unmodified environment, where trails may be present but structures are rare, and where probability of isolation from the sights and sounds of man is extremely high.

Progeny Test Areas—Areas devoted to testing and measuring procedures to determine the genetic feasibility of seed orchard production.

Programmatic–Pertaining to the overall system under which action may be taken to achieve desired conditions.

Project-level Decision—Decisions such as building a hiking trail, constructing a campground, or making a timber sale, which apply to a specific site.

Proposed Action—A proposal by the Forest Service to authorize, recommend, or implement an action.

Proposed Species—A species which data supports its listing as a federally endangered or threatened species. It is considered proposed until legally declared as endangered or threatened and made public in the Federal Register.

Purpose and Need—A statement which briefly specifies the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action. (40 CFR 1502.13)

R

Raptors—Birds of prey such as hawks and eagles.

Rare—Plant or animal species which are uncommon in a specific area. All endangered, threatened, and sensitive species can be considered rare, but the converse is not true.

Record of Decision—A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the selected alternative have been adopted, and if not, why not.

Recreation Opportunity Spectrum—A land classification system which categorizes National Forest land into six classes, each class being defined by its setting and by the probable recreation experiences and activities it affords.

Recreation Site Modification Levels

Development Scale

1	<u>Minimum site modification</u>. Rustic or rudimentary improvements designed for protection of the site rather than comfort of the users. Use of synthetic materials excluded. Minimum controls are subtle. No obvious regimentation. Spacing informal and extended to minimize contacts between users.
2	<u>Little site modification</u>. Rustic or rudimentary improvements designed primarily for protection of the site rather than the comfort of the users. Use of synthetic materials avoided. Minimum controls are subtle. Little obvious regimentation. Spacing informal and extended to minimize contacts between users. Motorized access provided or permitted. Primary access over primitive roads. Interpretive services informal, almost subliminal.

3 Site modification moderate. Facilities about equal for protection of site and comfort of users. Contemporary/rustic design of improvements is usually based on use of native materials. Inconspicuous vehicular traffic controls usually provided. Roads may be hard surfaced and trails formalized. Development density about 3 family units per acres. Primary access may be over high standard roads. Interpretive services.

4 Site heavily modified. Some facilities designed strictly for comfort and convenience of users. Luxury facilities not provided. Facility design may incorporate synthetic materials. Extensive use of artificial surfacing of roads and trails. Vehicular traffic control usually obvious. Primary access usually over paved roads. Development density 3-5 family units per acre. Plant materials usually native. Interpretive services often formal or structured.

5 High degree of site modification. Facilities mostly designed for comfort and convenience of users and usually include flush toilets; may include showers, bathhouses, laundry facilities, and electrical hookups. Synthetic materials commonly used. Formal walks or surfaced trails. Regimentation of users is obvious. Access usually by high-speed highways. Development density 5 or more family units per acre. Plant materials may be foreign to the environment. Formal interpretive services usually available. Designs formalized and architecture may be contemporary. Mowed lawns and clipped shrubs not unusual.

Recreation Visitor Day (RVD)—The unit of measure of recreation use. It is any combination of people and hours whose product is 12; i.e., 1 person for 12 hours, 2 people for 6 hours, 3 people for 4 hours, etc.

Recruitment Stand—A stand of trees which is at least 10 acres in size and is identified as potential nesting habitat required to meet the identified population goal on a compartment basis for red-cockaded woodpeckers. Recruitment stands are located between 1/4 mile and 3/4 mile from a cluster site. Foraging habitat is required for recruitment stands.

Red-cockaded Woodpecker Cluster—A group of pine trees containing live cavities excavated, maintained and used by a clan of red-cockaded woodpeckers for nesting and roosting. The aggregate of cavity trees composing each cluster has a minimum 200-foot buffer around it.

Red Heart *(Phellinus pini)*—Fungus which decays the heartwood of living pines with incidence increasing with tree age.

Rediversion Canal—A canal from Lake Moultrie on the Cooper River which diverts water into the Santee River.

Regeneration—The actual seedling and saplings existing in a stand; or the act of establishing young trees naturally or artificially.

Regeneration Harvests—Methods of tree harvesting such as clearcutting, shelterwood, or single tree selection to replace existing trees in an area with younger trees to achieve either short or long term objectives.

Region—A Forest Service administrative unit. The Francis Marion National Forest is a part of the Southern Region.

Regional Forester—The Forest Service official responsible for administering a single Region.

Release—Freeing trees from competition for light, water, and nutrients by removing or reducing the vegetation growth that is over-topping or closely surrounding them.

Relict Tree (Relicts)—A pine tree which is left over from the original forests that were logged during the period from 1890 - 1930. They are usually more than 100 years old and exhibit characteristics of high quality red-cockaded woodpecker cavity trees: presence of red-heart fungus at average cavity height, 14 inches DBH or larger, high ratios of heart wood to sap wood, and large, flat topped crowns with large limbs.

Replacement Stand–A stand of trees at least 10 acres in size, identified within 1/2 mile of a red-cockaded woodpecker cluster site as replacement nesting habitat for the existing cluster. The closer the replacement stand can be placed to the cluster site the better, with the ideal being adjacent to the cluster site. The number of replacement stands equals the number of active and inactive clusters. Foraging habitat is not required for replacement stands because they are replacement nesting habitat for an existing cluster with foraging habitat already assigned.

Research Natural Area (RNA)—An area classified as a physical and biological unit in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geologic and aquatic features.

Resilience—The capability of plants, animals, or environments to return to a previous state or condition after alteration.

Retention—A visual quality objective which, in general, means human activities are not evident to the casual forest visitor.

Revenue—Money received from land based activities on the National Forest such as the sale of wood products, fees from campgrounds, or special use permit fees.

Right-of-Way—An accurately located strip of land with defined area, within which the user has authority to conduct operations approved or granted by the landowner.

Riparian Areas—Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of the aquatic and riparian ecosystems, floodplains, and wetlands. They include all areas within a horizontal distance of 100 feet from the edge of perennial streams or other water bodies.

Riparian Ecosystems—A transition between the aquatic ecosystem and the adjacent terrestrial ecosystem and identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

Riverine—Living or situated on the banks of a river.

Road Density—The measure of road miles per land area.

Roaded Natural—A classification of the recreation opportunity spectrum that characterizes a predominately natural environment with evidence of some resource utilization.

Roadless Areas—(East of the 100th meridian). An area which contains no more than a half mile of improved road for each 1,000 acres and the road is under Forest Service jurisdiction.

Roadless Area Review and Evaluation II (RARE II)—The assessment of roadless and undeveloped land areas within the National Forests as potential wilderness areas.

Roads, Forest System—Roads that are part of the Forest development transportation system, including all existing and planned roads, as well as other special and terminal facilities designated as Forest development transportation facilities.

Rotation—The number of years required to establish and grow timber crops to a specified condition of maturity for regeneration harvest.

Roundwood—Trees that are used without being milled (fence posts, telephone poles, pulpwood, etc.).

RPA—The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the national assessment and recommended program developed to fulfill the requirements of the Act.

RPA Program—The recommended direction for long-range management of renewable resources of National Forest system lands.

Rural Class—A recreation opportunity spectrum classification for areas characterized by a substantially modified natural environment.

S

Salvage—Removing trees that are dead or in imminent danger of being killed by injurious agents.

Savannah—A flat, almost treeless grassland.

Sawtimber—Trees that will yield logs suitable in size and quality for the production of dimension lumber.

Scheduled—Lands needed for timber production to meet forest plan goals and objectives. This serves as basis for determining allowable sale quantity, and for determining long-term sustained yield timber capacity.

Scoping—The process by which the Forest Service determines the extent of analysis necessary for an informed decision on a proposed action.

Sediment—Solid material, both mineral and organic, that is being transported or has been moved from its site of origin by air, water or gravity and has come to rest on the earth's surface either above or below sea level.

Sediment Yield—Amount of solid waste delivered into a watercourse.

Seed Orchard—An area containing trees, selected on certain desired heritable characteristics, which are bred to produce seed.

Seed Tree Cutting—The removal in one cut of most of the mature timber from an area except for a small number of desirable trees retained to provide seed for regeneration.

Semiprimitive Motorized (ROS) Class—A classification of the recreation opportunity spectrum characterized by a predominantly un-modified natural environment in a location that provides good to moderate isolation from sights and sounds of man.

Semiprimitive Nonmotorized (ROS) Class—A classification of the recreation opportunity spectrum characterized by a predominantly un-modified natural environment of a size and location that provides good to moderate opportunity for isolation from sights and sounds of man. Management excludes motorized equipment.

Sensitive Species—Those species which (1) have appeared in the Federal Register as proposals for classification and are under consideration for official listing as endangered or threatened species, (2) are on an official State list, or (3) are recognized by the Regional Forester to need special management in order to prevent the need for their placement on Federal or State lists.

Shelterwood cut—A method of establishing a new stand by gradually removing the existing trees so that new seedlings or sprouts become established under the protection of the remaining trees. Normally, this is done in two separate harvests over a 5 to 10 year period.

Short-term effects—Those effects which will usually occur within the next 20 years.

Shrink Swell Clays—Clays that swell when moisture increases and shrink when moisture decreases.

Significant Environmental Effects—This is defined as used in NEPA, 40 CFR 1508.27 which is considered in context and intensity.

Silviculture—The art and science of controlling the establishment, composition, and growth of forests.

Silvicultural System—A combination of interrelated actions whereby forests are tended, harvested and replaced.

Silvicultural Treatments—Activities used in controlling forest establishment, growth and composition such as harvesting trees, preparing sites, thinning, release, prescribed burning, pre-commercial thinning or fertilization.

Single Tree Selection Cut—A cut that removes individual mature or immature trees based on their age, merchantability, health, seed production capability, and potential to increase in volume and quality.

Site Preparation—Preparation of the ground surface before planting or natural regeneration.

Site Specific—Pertaining to an area where an individual project takes place such as a timber sale area, a campground, a trail route, etc.

Skid Trail—Travelway used to drag or transport trees from the stump to a landing area for loading on a truck.

Slash—Woody debris left after logging, pruning, thinning or brush cutting.

Sludge—Solids removed from sewage during waste water treatment.

Snag—A standing dead tree, used by wildlife species for nesting, roosting, perching, courting and/or foraging for food.

Softwoods—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Soil Compaction—Reduction of soil volume which results in alteration of soil, chemical and physical properties.

Soil Fertility—The quality of a soil that enables it to provide nutrients in adequate amounts and in proper balance for the growth of specified plants.

Soil Productivity—The capacity of a soil to produce a specific crop.

Soil Profile—A progression of distinct layers of soil from the surface to bedrock.

Soil Texture—The relative proportions of sand, silt and clay in a soil.

Southern Pine Beetle (SPB)—A native bark beetle affecting pines from Texas to Virginia. Usually an attack is fatal to the tree. All southern pines are susceptible to SPB (*Dendroctonus frontalis*).

Spatial Feasibility—The capability of alternative solutions to be practically implemented on the ground.

Special Interest Area—Areas established and managed for their unique special features. Examples are scenic and botanical areas.

Special Use Permits—Authorization for use and occupancy of National Forest system land.

Species Composition—The relative amounts and mixtures of tree species within an area.

Spotting—Ignition of fires outside the perimeter of a large fire as a result of windblown firebrands.

Spurges—Any of several plant species in the family *Euphorbiaceae*.

Stand—A timber plant community possessing sufficient uniformity regarding vegetation type, age class, vigor, size class and stocking class to be distinguishable from adjacent communities.

Standard—Requirements which preclude or impose limitations on resource management practices and uses generally for resource protection, public safety or addressing an issue. Standards are measurable, capable of being monitored, and attainment is mandatory. Deviation requires a plan amendment.

Stocking—The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

Suitable for Timber Production—Those lands which will be managed for timber products under long-term sustained yield.

Suitable RCW Habitat—Southern yellow pine (except sand pine) and southern yellow pine-hardwood types are considered as potentially suitable red-cockaded woodpecker habitat.

Succession—The progressive development of vegetation through the replacement of one plant community by another.

Successional Stage—A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax; for example coniferous forests in the southeast progress through grass-forb to pole-sapling to young to mature to old growth stages.

Supply—The amount of an output that producers are willing to provide at the specified price, time period, and condition of sale.

Sustained Yield—The achievement and maintenance in perpetuity of a high-level annual or regular periodic yield of the various renewable resources without impairment of the productivity of the land.

System Roads—Roads on the Forest are comprised of roads under jurisdictions of the Forest Service, state, county, or other federal agencies. Roads under the jurisdiction of the Forest Service are called Forest Development Roads and are often referred to as system roads.

T

Temporary Roads—Any short-lived road not intended to be a part of the transportation system and not necessary for future resource management.

Tent Caterpillars *(Malacosoma disstria)*— The larva of this species is a common defoliator of forest trees. The most preferred trees are oaks and gums.

Threatened Species—Any species listed in the Federal Register which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Thinning—Cutting made in an immature stand, primarily to accelerate the diameter increment (annual growth) of the residual trees, but also by suitable selection, to improve the average form of the trees that remain.

Tidal Surge—An unusually high sea wave pushed ahead of a hurricane.

Tiering—Incorporating information contained in an EIS (Environmental Impact Statement), such as the Forest Plan EIS, by reference in subsequent environmental documents.

Timber—A wood product suitable for use in construction. Sometimes used in reference to standing trees containing a wood product.

Timber Site Index—A measure of site productivity based on the maximum rate of tree height growth.

Timber Stand Improvement (TSI)—Activities conducted in young stands of timber to improve growth rate, form and composition of the remaining trees.

Tolerant Species—Species that reproduce and form understories beneath canopies of less tolerant trees or even beneath their own shade.

Traffic Service Levels—Traffic service levels describe the significant traffic characteristics and operating conditions for a road.

Trail Heads—The point at which a trail begins which often includes parking and a bulletin board.

Transient Species—Wildlife that pass through an area with a short duration of stay.

Transition Zones—Areas of variable size where one forest type or landtype blends with an adjacent type. Most often used to refer to an area where pine forest types blend with hardwood forest types.

Travel Corridor—A road, trail, or waterway used by people; or a strip of land used by wildlife.

3/4 Mile Zone—The National Forest lands around a red-cockaded woodpecker cluster site which would be managed using this conservation strategy. This zone is a 3/4 mile radius circle from the center point of the cluster site and covers approximately 1,117 acres. In practice, this zone might not be a perfect circle because of intermingled private lands, topographic features and vegetation types that would not be included within the boundary.

Twenty-Five Percent Fund—Funds distributed under the authority of the Act of May 23, 1908, as amended (16 U.S.C. 500). Twenty five percent of all moneys received during each fiscal year from a National Forest is paid to the counties in which the National Forest is located for the benefit of public schools and public roads.

U

Understory—The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Uneven-aged Management—The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (36 cfr 219.3)

Unique Areas—Special areas which are managed for scenic, botanical, geologic, or historic values.

Unplanned Ignition—A fire started at random by either natural or human causes, or a deliberate incendiary fire.

Unscheduled—Lands not needed for timber production to meet forest plan goals and objectives. This includes financial and economic considerations or lands where there is a need to defer a determination of suitability. They are not used in the determination of allowable sale quantity or long-term sustained yield. Harvest is permitted for salvage sales, protection of non-timber multiple use values, and activities that meet non-timber objectives of the Plan.

Unsuitable For Timber Production—Forest land that is not managed for timber production because (a) the land has been withdrawn by Congress, the Secretary, or the Chief; (b) the land is not producing or capable of producing crops of industrial wood; (c) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions; (d) there is no reasonable assurance that lands can be adequately restocked within five years after final harvest, based on existing technology and knowledge, as reflected in current research and experience; (e) there is at present, a lack of adequate information to responses to timber management activities; or (f) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple-use objectives specified in the Forest Plan.

Urban ROS Class—A classification of the Recreation Opportunity Spectrum in which the natural setting is dominated by man-made structures and the sights and sounds of man predominate.

User Fees—A fee charged for the use of the forest such as for camping, hiking, swimming, hunting, rights-of-way, etc.

V

Vegetation Management—The management of vegetation by practices such as grazing, prescribed burning, herbicide use, timber harvesting, and tree planting or removal to meet wildlife, visual, timber, special area, water and other management objectives.

Viability—The population of sufficient numbers to maintain its existence over time in spite of normal fluctuations in population levels.

Viewshed—Portion of the Forest that is seen from a major travel route, or high use location.

Visual Quality Objective (VQO)—The degrees of acceptable alteration of the characteristic landscape.

Visual Resource—The composite of basic terrain, geologic features, water features, vegetative patterns, and land-use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

Water Yield—The total net amount of water produced on the Forest including stream flow and ground water re-charge.

Wet Sites—Areas with very poorly and poorly drained soils.

Wetland—Areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds (very poorly drained soils are associated with wetlands).

Wild and Scenic Rivers—Those rivers or sections of rivers designated as such by congressional action under the 1968 Wild and Scenic Rivers Act, as supplemented and amended, or those sections of rivers designated as wild, scenic, or recreational by an act of the Legislature of the State or States through which they flow.

Wilderness—Congressionally designated areas that are essentially un-altered and undisturbed by man. Management in these areas preserves and protects their physical and biological characteristics.

Wildfire—Any wildland fire not designated and managed as a prescribed fire within an approved prescription.

Wildlife and Fish User Day (WFUD)—A unit used to measure the amount of use the public gets from wildlife and fish found on the Forest. One WFUD represents one person hunting, fishing or viewing wildlife for a period of 12 hours.

Wildlife Corridor—Continuous habitats that link other, similar areas.

Wildlife Openings—Areas maintained in an open, early successional stage to provide habitat for wildlife.

Within-Stand Diversity—The relative variety of life in a forest stand.

Wood Products—Products derived from trees such as sawtimber, roundwood and fuelwood.

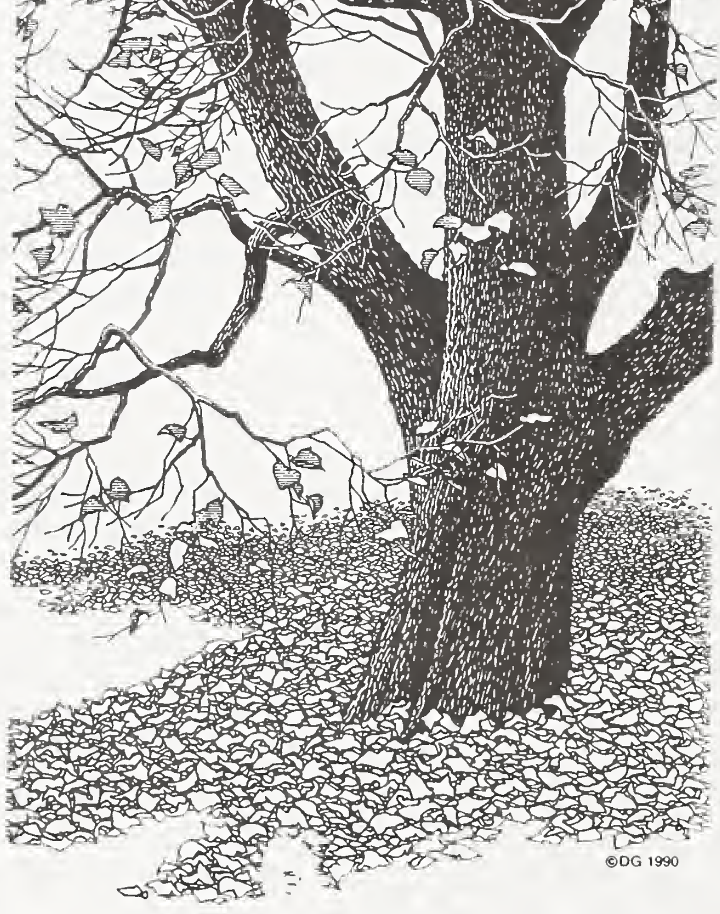
Y

Yield Table—A tabular statement of yields expected to be produced under a specified set of conditions.

ACRONYMS

ASQ—Allowable Sale Quantity
ATV—All Terrain Vehicle
BE—Biological Evaluation
BMPs—Best Management Practices
CE—Corps of Engineers
CEQ—Council on Environmental Quality
CFR—Code of Federal Regulations
CISC—Continuous Inventory of Stand Conditions
DBH—Diameter Breast Height
DHEC—South Carolina Department of Health and Environmental Control
DEIS—Draft Environmental Impact Statement
DFC—Desired Future Condition
EA—Environmental Assessment (or Analysis)
ESA—Endangered Species Act
EIS—Environmental Impact Statement
FEIS—Final Environmental Impact Statement
FMNF—Francis Marion National Forest
EPA—Environmental Protection Agency
FORPLAN—Forest Planning Model
FS—Forest Service
FSH—Forest Service Handbook
FSM—Forest Service Manual
FY—Fiscal Year
GIS—Geographic Information System
IMPLAN—Impact Analysis for Planning
LTSY—Long Term Sustained Yield
HMA—Habitat Management Area
M—Roman numeral for one thousand (1,000)
LMP—Land Management Plan
MAR—Management Attainment Report
MBF—Thousand Board Feet
MCF—Thousand Cubic Feet
MM—Roman numeral for one million (1,000,000)
NEPA—National Environmental Policy Act
NF—National Forest
NFMA—National Forest Management Act
NFS—National Forest System lands
NPB—Net Public Benefits
OHV—Off-Highway Vehicle
ORV—Off-Road Vehicle
PNV—Present Net Value
PETS—Proposed, Endangered, Threatened, and Sensitive species

RCW—Red-Cockaded Woodpecker
RD—Ranger District
RM—Roaded Modified
RN—Roaded Natural
RNA—Research Natural Area
ROD—Record of Decision
ROS—Recreation Opportunity Spectrum
RPA—Forest and Rangeland Renewable Resource Planning Act of 1974
RVD—Recreation Visitor Day
R-8—Forest Service, Southern Region
R-8 FEISVM—*Region 8 Final Environmental Impact Statement for Vegetation Management*
SCPRT—South Carolina Parks, Recreation and Tourism Department
SCS—Soil Conservation Service
SCWMRD—South Carolina Wildlife and Marine Resources Department
SPB—Southern Pine Beetle
SPNM—Semi-Primitive, nonmotorized
T & E—Threatened and Endangered
TSI—Timber Stand Improvement
USDA—United States Department of Agriculture
USDI—United States Department of the Interior
VQO—Visual Quality Objective
WMA—Wildlife Management Area
WFUD—Wildlife and Fish User Days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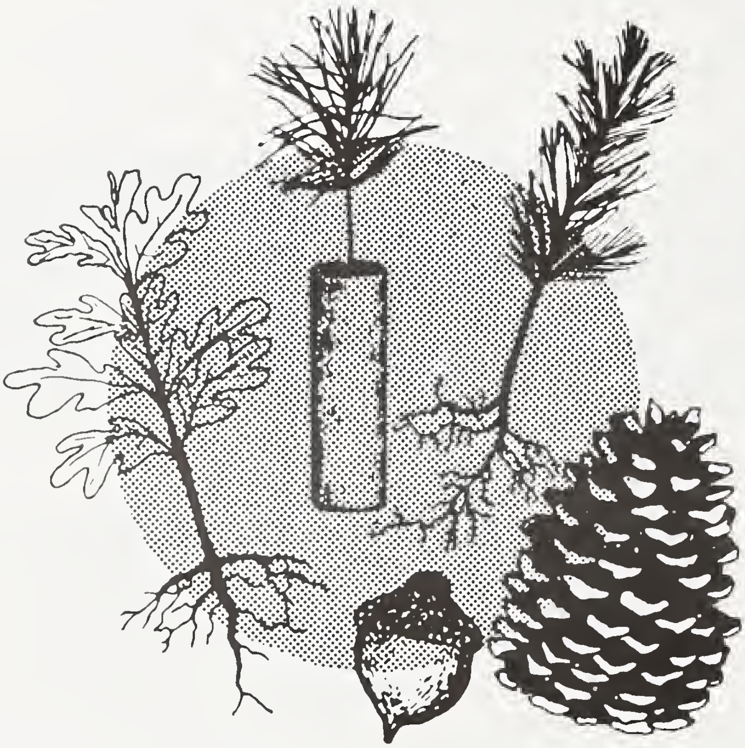

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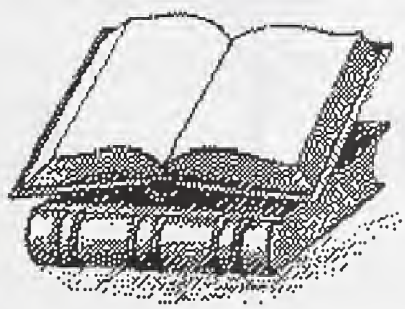

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Appendix A
Public Involvement

Public Involvement in Scoping

- In June 1990, a Notice of Intent to revise the Forest Plan was published in the *Federal Register*.

- In June 1990, about 200 letters and response forms were mailed to individuals, organizations, businesses, and county, state and federal agencies. The letter asked that the response form be returned to our office by August 15, 1990.

- 622 written responses were received

- About 2,500 individual comments were identified within the written responses.

- In July 1990, approximately 200 letters were mailed to individuals, organizations, businesses, and county, state and federal agencies. The letter invited them to share their ideas for the future management of the Forest at public meetings to be held in five locations. About 100 people expressed their concerns at these public meetings.

Issue Development

- In November 1990, the Forest interdisciplinary and management teams reviewed the comments generated during the scoping process and agreed on 17 issues. This list included public issues and management concerns that needed to be addressed.

- In February 1991, the 17 issues were published in planning Newsletter #1. A stamped, addressed postcard was enclosed to solicit additional input and serve as a check on our analysis of the public's desires and concerns. Although about 700 copies were mailed; only 12 postcard comments were received.

- In April 1991, the Forest interdisciplinary and management teams reviewed the comments and determined that the public concerns had been adequately addressed and no changes were necessary

- In October 1991, the draft issues were published in planning Newsletter #2. About 800 copies were mailed.

Alternative Development

- In December 1991, the Forest interdisciplinary team and management team agreed on four general alternatives.

- In December 1991, planning Newsletter #3 including the alternatives was published. A response form was included for comments. Initially, 800 copies were mailed. Due to requests, an additional 250 copies were printed and distributed.

- Over 400 written responses were received containing over 3,000 individual comments. About 80 percent of the comments were about trail use, off-highway use and road access.

- As a result of the public comments, two additional alternatives were developed and approved by the Forest interdisciplinary and management teams. The existing alternatives were modified to address public concerns and to improve clarity in alternative descriptions.

- In July 1992, planning Newsletter #4 including the six draft alternatives was published and mailed.

- During the development of this DEIS, numerous informal contacts were made with the public, and some issues were changed as follows.

CORRIDORS CONNECTING WILDERNESS AREAS—This issue received renewed interest and is being added based on meetings with agency officials, interest groups and individuals.

DISPOSAL OF TREATED SEWAGE is not being addressed as an issue. After further review, it was decided that this issue is best handled on a case-by-case basis in a site-specific evaluation.

PUBLIC INFORMATION AND EDUCATION is not being addressed as an issue. It is agreed that the current level of public information and education is not adequate. Rather than an issue, it is an opportunity that will be addressed in the Land Management Plan.

CLEARCUTTING is no longer addressed as a separate issue. It is being addressed under harvest methods in the **TIMBER MANAGEMENT STRATEGY** issue.

- The DEIS now addresses 14 issues found in Chapter 1.

- Throughout the past three years, formal presentations or informal meetings were held with the following groups at their request:

  ◊ Sierra Club
  ◊ The Wildlife Society
  ◊ Southern Timber Purchasers Council
  ◊ Society of American Foresters
  ◊ South Carolina Coastal Conservation League
  ◊ Clemson University—Forest Resources Dept.
  ◊ Southern Mudders 4WD Club
  ◊ Family Riders Motorcycle Club
  ◊ Jericho Horse Riders/Swamp Fox Trail Riders
  ◊ South Carolina Wildlife and Marine Resources Dept. (SCWMRD)
  ◊ South Carolina Forestry Association

APPENDIX B
The Analysis Process

Appendix B presents a technical discussion of the analysis process and computer models used in the revision planning effort. The appendix focuses on the quantitative methods used to perform the analysis and documents how the analysis was done.

The Forest's major planning goal is to provide enough information to help decisionmakers and the public determine which combinations of goods, services and land allocations will maximize Net Public Benefits (NPB). The regulations (36 CFR 219) developed under the National Forest Management Act (NFMA) provide the analytical framework within which these decisions are made.

The NFMA and its regulations also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in the analytical process. The NEPA regulations require that the environmental effects of a proposed action and alternatives to that proposed action must be disclosed in an Environmental Impact Statement (EIS).

Information presented in this chapter supplements the broader and less technical descriptions included in the body of the EIS. This discussion includes basic assumptions, modeling components and inputs, rules, methods, and constraints. Additional information and documents used in the analysis process are contained in the planning records. The planning record in its entirety is incorporated here by reference.

The results from the modeling process are estimates of what can be expected if alternatives are implemented and facilitate comparison of alternatives.

The Planning Process

Land and resource management planning requires that processes formally used to make individual resource decisions be combined into integrated management decisions. It also requires that mathematical modeling techniques be used to identify the most economically efficient solution to meet the goals and objectives of any alternative.

The 10-step process defined in the NFMA regulations was followed. This appendix is concerned with describing the analysis phase of this process which are steps 2, 3, 4, 5 and 6. Steps 1, 7, and 8 are described in Chapters 1 and 2 and Appendix A of this EIS. Plan implementation and monitoring, steps 9 and 10, are discussed in the revised Forest Plan. A brief discussion of this process follows.

Identification of purpose and need: Issues, Concerns and Opportunities (Step 1)—The Forest ID team assessed changes in public issues, management concerns and resource use and developmental opportunities since the Forest Plan was initially developed and subsequently amended. Appendix A of this EIS documents this step.

Planning Criteria (Step 2)—Criteria are designed to guide the collection and use of inventory data and information, the analysis of the management situation; and the design, formulation, and evaluation of alternatives. This step establishes guidelines for accomplishing the next five steps. The work plan and other process records document this step.

Inventory Data and Information Collection (Step 3)—The kind of data and information needed is determined in Step 2 based on the issues, concerns and opportunities identified and the resulting assessment of the management situation and determination of what needs to change. Data collection is part of normal Forest operations. Existing data is used whenever possible and supplemented with new data, when practicable, if new data will contribute to more responsive analysis. Data accuracy is continually evaluated. Much of this data and background documentation is on file in the planning (or process) records on file in the Supervisor's Office.

Analysis of the Management Situation (Step 4)—This step consists of assessing the existing situation on the Forest and determining opportunities for resolving issues and concerns. This information provides the basis for formulating an appropriate range of reasonable alternatives.

This analysis brings existing information together, puts it into a total Forest perspective, and examines the range of possible situations to resource issues. It examines supply potentials and market assessments for goods and services, and determines suitability and feasibility for meeting needs. Other objectives of the analysis of the management situation include the following.

— Assessing current direction including a schedule of goods and services most likely to be provided if current direction is continued.
— Assessing demand for goods and services from National Forest lands.
— Determining if there is a need to change current management direction.

Formulation of Alternatives (Step 5)—A reasonable range of alternatives is formulated according to NEPA procedures. Alternatives are formulated to assist in identifying one that comes nearest to maximizing NPB. They provide for the resolution of significant issues and concerns identified in Step 1. The alternatives reflect a range of resource management programs. Each identified major public issue and management concern is addressed in different ways in the alternatives. The programs and land allocations in each alternative represent the most cost-efficient way of attaining the goals and objectives for that alternative. Both priced and non-priced goods and services (outputs) are considered in formulating each alternative.

Estimated Effects of Alternatives (Step 6)—The physical, biological, economical and social effects of implementing each alternative are considered in detail to respond to the issues and need for change.

The FORPLAN model estimates some, but not all, of the economic and physical effects. Other effects examined outside the model include ecological and social considerations. The effects of the alternatives are displayed in Chapter 2 and 3 of this EIS.

Evaluation of Alternatives (Step 7)—Significant physical, biological, economical and social effects of implementing alternatives are used to evaluate each alternative and compare them with each other. Typically, each alternative can be judged on how it addresses the significant issues identified in Chapter 1 of the EIS. Chapter 2 of the EIS summarizes the comparisons of the alternatives with the issues.

Preferred Alternative (Step 8)—The Forest Supervisor reviews the ID Team evaluation of each alternative and the public issues and concerns. The Forest Supervisor then recommends a preferred alternative to the Regional Forester. The Regional Forester either selects the Forest Supervisor's recommendation, another alternative, or modifies the alternative recommended by the Forest Supervisor. This alternative is described as the preferred alternative in this EIS and is displayed as the Proposed revised Forest Plan. The Forest Service's preferred alternative is first announced in the Abstract Section of this EIS. Public comments are solicited and will be considered in the finalizing of the draft revised Forest Plan and EIS.

Plan Approval and Implementation (Step 9)—After the ID Team has reviewed public comments and incorporated any necessary changes into the EIS or revised Forest Plan, the Regional Forester reviews and approves the Revised Forest Plan and Final Environmental Impact Statement. A Record of Decision (ROD) documents this step.

Monitoring and Evaluation (Step 10)—The Revised Forest Plan establishes a system of measuring, on a sample basis, actual activities and their effects, and compares these results with projections contained in the Revised Forest Plan. Monitoring and evaluation comprise an essential feedback mechanism to ensure the Revised Forest Plan is dynamic and responsive to change. Chapter 4 of the Revised Forest Plan displays the Monitoring and Evaluation program.

Planning Criteria and Data Collection

The NFMA regulations require planning criteria be developed to guide each step in the planning process. Process criteria are the standard rules and tests to guide and measure the effectiveness of the planning process. Criteria apply to collection and use of inventory data and information; analysis of the management situation; and the design, formulation and evaluation of alternatives.

Planning criteria are based on the following:

1. Laws, Executive Orders, regulations and agency policy as set forth in the Forest Service Manual;

2. Goals and objectives in the RPA Program and regional guides;

3. Recommendations and assumptions developed from public issues, management concerns and resource use and development opportunities;

4. The plans and programs of other federal agencies, state and local governments and Indian tribes.

5. Ecological, technical and economical factors; and

6. The resource integration and management requirements in 36 CFR 219.13 through 219.27.

In addition, the Land and Resource Management Planning Handbook (FSH 1909.12) requires the following criteria also be applied:

1. Alternatives are technically possible to implement.

2. Alternatives meet management requirements or standards.

3. Various levels of multiple–use objectives and outputs are achieved.

Inventory Criteria and Needs

The ID team, with assistance from resource specialists and District personnel collected data, maps, graphic material and explanatory aids appropriate for addressing the issues and conducting required analysis. Inventory was done to the detail necessary to support the management decisions to be made.

The following criteria apply to all elements in the inventory phase:

1. Use existing data unless it is inadequate.

2. New data and information will be collected on an as-needed basis.

3. Sources of information and data will be documented in the planning records.

4. The Geographic Information System (GIS) system will be used for map storage and manipulation, spatial analysis and generating maps for the Forest Plan.

5. The attribute system in GIS will be used when possible to store, manage and display data associated with mapping units.

6. Only information stored in GIS will be used to develop capability and management areas for use in FORPLAN.

7. Where assumptions are used in lieu of specific data or information the following actions shall be carried out:

   (1) Identify analytical techniques and associated assumptions used.
   (2) Document why each assumption was used.
   (3) State the basis upon which the analytical techniques and assumptions were selected (identify advantages and disadvantages of each).

Table B-1 was developed by the ID team to identify inventory and data needs for the Francis Marion National Forest. The table is organized so that the data requirement responds to an issue or concern, or to a FSM, NFMA or Executive Order requirement.

Table B-1.		**Database development.**			
Data Requirement		**Data need Responds to:**			**Unit of Measure**
		Issue	**FSM**	**CFR Regs**	
Soil and Water					
1.	Inventory impoundments and other waterbodies			219.27e	Acres
2.	Wetlands–USGS maps	Wetlands		219.12k(6)	Acres
3.	Site productivity–by site productivity classes	Timber Mgt.	1922.15	21.27b(1)	Acres
4.	Perennial Streams			219.27e	Miles
Recreation					
1.	Recreation Area Inventory				
	Wilderness	Facility		219.18	Acres
	Hampton Plantation			218,21b	Acres
	Swamp Fox Trailhead			219.21b	Acres
	Guilliard Lake			219.21b	Acres
	Developed Recreational Sites			219.21b	
	Fishing on Navigable Streams			219.21b	Miles
2.	Trail Inventory by Type	Trails			
	Horse			219.21b	Miles
	Hiking			219.21b	Miles
	Cycle			219.21b	Miles
3.	Road Inventory by Type	Roads			
	Federal, state and county			219.27a	Miles
	Forest			219.27	Miles
Wildlife					
1.	Wildlife Emphasis Stands	Habitat		219.19	Acres
2.	RCW Colonies	ET&S		219.19a(7)	Acres
3.	All ET&S Sites	ET&S		219.19a(7)	Acres
Vegetation					
1.	Forest Type	Dist.		219.26	Acres
2.	Size Condition Class	Timber Mgt.		219.27a	Acres
3.	Age	Timber Mgt.		219.27a	Acres
4.	Stocking	Timber Mgt.		219.27c	Acres
5.	Basal Area	Timber Mgt.		219.12d	Acres
6.	Productivity Class	Timber Mgt.		219.12d	Acres
7.	Land Class	Timber Mgt.		219.14	Acres
8.	Drainage Class	Dist.		219.26	Acres
9.	Soil Type	Dist.		219.26	Acres
Water					
1.	USF&WS Wetlands (Area Data)	Wetlands		219.23f	Acres
2.	USF&WS Wetlands (Area Data)	Wetlands		219.23f	Miles
3.	Streams	Wetlands		219.27e	Miles
4.	Waterbodies	Wetlands		219.273	Acres
Community					
	Ownership	Economy		219.12d	Acres
Miscellaneous					
	Administrative Boundaries				
	Counties			219.12d	Acres
	Districts			219.12d	Acres
	Compartments & Stands			219.12d	Acres
	Archaeological Sites			219.24	Acres
	Archaeological Survey Areas			219.12	Acres
	Utility Corridors			219.12d	Miles
	Railroads			219.12d	Miles

The issues in Chapter 1 were an important basis for determining what data needed to be updated or collected and what effects would be evaluated. Both existing data and new information were used in the revision of the Forest Plan. Important data was entered into either Region 8's CISC data base or into GIS.

Most of the allocation modeling was accomplished through two major analytical tools.

1. A Version 2 FORPLAN computer model was used to simulate land allocations and provide information on outputs and costs.

2. GIS was used to perform some pre-determined allocations and to define management area prescription options based on the goals and objectives of the alternatives and resource inventories.

Two basic types of information are not directly tied to a map base but have more to do with the estimation of how land will respond to certain management activities within a given alternative. This can be viewed as the goods and services discussed in EIS chapters 2 and 3. In linear programming, these are called production coefficients. This type of information came from many sources: Regional procedural handbooks, professional research studies, Master's theses, etc. The most up-to-date and verifiable information was used for the revision.

GIS Data Layers

Many different physical, biological, or administrative layers of resource-related information are contained in the GIS. The compilation of the various inventories into the GIS mapping system resulted in several layers of land attribute and management opportunity delineations. These layers formed the basis for the resource data used for programmatic analysis. Table B-2 shows the data stored in GIS that were used in the formulation and effects analysis of the alternatives.

Table B-2. GIS data layers used in the revision

Land Ownership	Waterbodies	Soils
Land Use	Recreational Areas	PETS Sites
Archaeological Sites	Timber Stands	Utility Lines
Red-cockaded Woodpecker Clusters	Landmarks	Geology
Trails	Unique Areas	Compartments
Roads	Wilderness Areas	Political Boundaries
Streams	Roadless Areas	ROS Classes
VQO Classes		

Ecological Classification System

An ecological classification system is a procedure, within a hierarchal framework, for delineating, naming and describing units of land with management significance and ecological integrity. Within each unit or level, there are different criteria which address various levels of planning. The two units or levels of concern to Forest land management planning are landtype associations and landtypes. Following is a discussion of various landtypes found within these landtype associations, a landtype map and a matrix (Table B-3) for landtype association development. (See the LTA map in Chapter 2.)

Swamps Landtype Association

A (Interior Swamps) Characterized by very poorly drained swamp deposits with a sand, loam and sandy loam surface soil texture. The landform is predominantly swamps and bays interspersed with upland flats. Predominant tree species include swamp hardwoods with a component of loblolly pine and brushy species. (16,976 acres)

River/Creek Bottoms Landtype Association

B (Santee River Floodplains) Characterized by poorly drained river deposits along the floodplain of the Santee River with a clay loam surface soil texture. Predominant tree species include bottomland hardwoods with a component of swamp hardwoods. (3,343 acres)

D (Wambaw Creek Swamps) Characterized by poorly drained river and swamp deposits along Wambaw Creek and the Santee River with a sandy loam surface soil texture. Swamp hardwoods and bottomland hardwoods are the predominant tree species. (3,930 acres)

Swampy Flats Landtype Association

C (Wambaw Swampy Flats) Characterized by poorly drained upland flats and swamp deposits with a loam, and loamy sand surface soil texture. Current forest type vegetation is predominantly loblolly pine and swamp hardwoods with a component of bottomland hardwoods and mixed pine/hardwood types. (21,264 acres)

Flatwoods Landtype Association

E (Poorly Drained Flatwoods/Bays) Characterized by poorly drained and very poorly drained river and swamp deposits with a sandy loam and loam surface soil texture. The landform is predominantly upland flats interspersed with bays. Loblolly pine with a component of swamp hardwoods and mixed pine/hardwoods is the predominant tree species. (21,317 acres)

F (Back Barrier Depressions) Characterized by a mixture of poorly drained, very poorly drained and somewhat poorly drained back barrier deposits with a sandy loam, clay loam and loam surface soil texture.

The landform is predominantly upland flats interspersed with bays. The predominant tree species is loblolly pine with areas of swamp hardwoods, longleaf pine and bottomland hardwood types interspersed. (27,220 acres)

Loamy Ridges /Flats Landtype Association

G (Poorly Drained Loamy Ridges) Characterized by somewhat poorly and poorly drained ridges of river and backbarrier deposits with a sandy loam, loam and clay loam surface soil texture. Loblolly pine with areas of longleaf pine and bottomland hardwood types is the predominant tree species. (18,064 acres)

H (Loamy Creeks/Flatwoods) Characterized by poorly drained and somewhat poorly drained ridges and upland flats of back barrier and river deposits with a sandy loam and loam surface soil texture. Predominant tree species is loblolly pine with a component of bottomland hardwood. (20,702 acres)

Sandy Ridges/Side Slopes Landtype Association

I (Poorly Drained Sandy Ridges) Characterized by somewhat poorly and poorly drained ridges of beach deposits with a loamy sand, sandy loam and loam surface soil texture. Predominant tree species are longleaf pine and loblolly pine. (4,454 acres)

J (Bonneau Beach) Characterized by somewhat poorly and poorly drained ridges of beach deposits with a sandy loam, loam and clay loam surface soil texture. Predominant tree species are longleaf pine and loblolly pine. (8,502 acres)

K (Santee Loamy Ridges) Characterized by moderately drained ridges of river deposits with a sandy loam, loam and loamy sand surface soil texture. Poorly drained to somewhat poorly drained soils are also found scattered throughout the area. Loblolly pine with a component of longleaf pine and mixed pine/hardwood types is the predominant tree species. (16,747 acres)

L (Well Drained Side Slopes/Flats) Characterized by moderately and well–drained beach deposits with a loamy sand, sand and sandy loam surface texture. The landform is predominantly side slopes interspersed with bays. Predominant tree species include loblolly and longleaf pine with a component of swamp hardwoods on the very poorly drained areas. (86,984 acres)

Landtypes

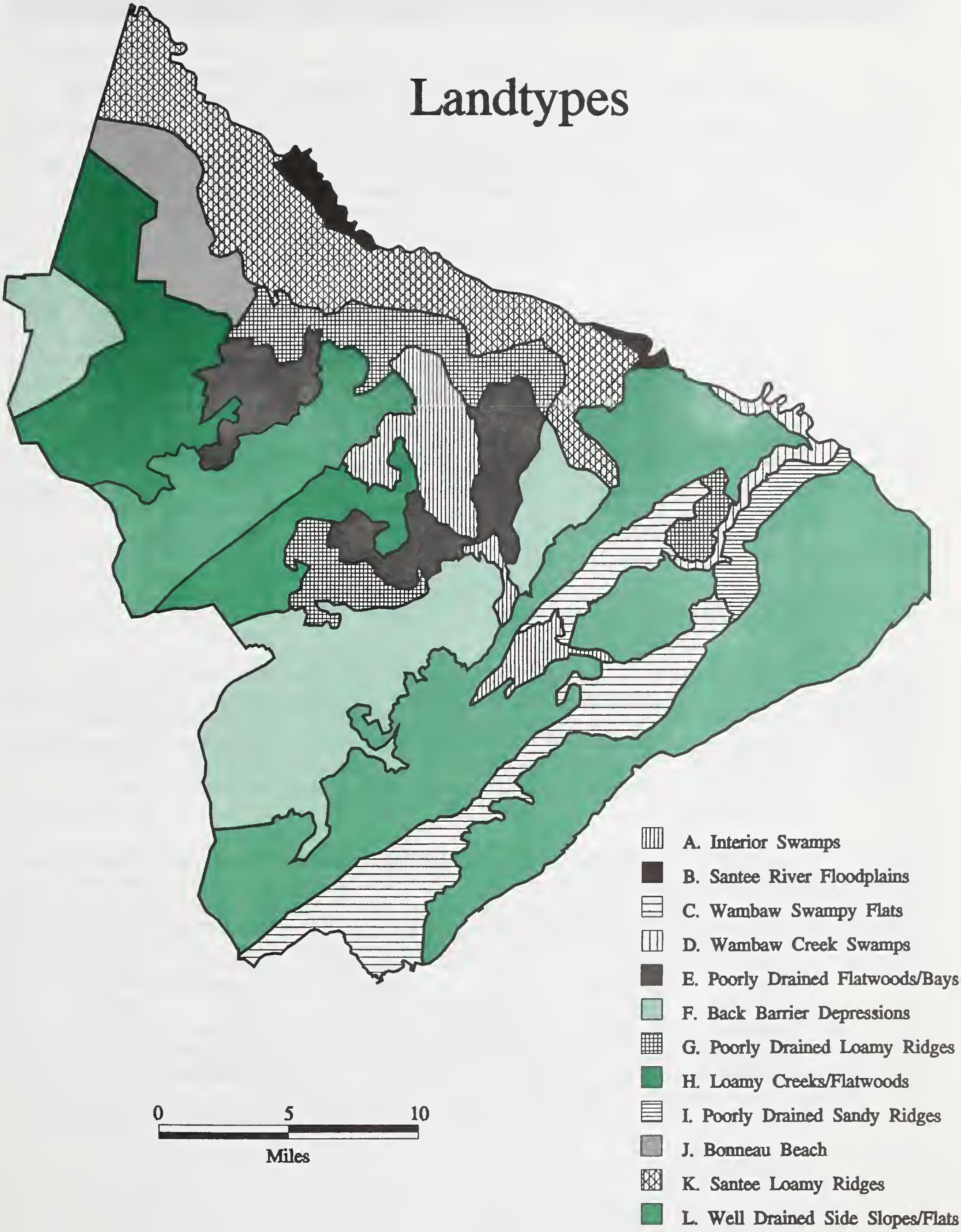

A. Interior Swamps
B. Santee River Floodplains
C. Wambaw Swampy Flats
D. Wambaw Creek Swamps
E. Poorly Drained Flatwoods/Bays
F. Back Barrier Depressions
G. Poorly Drained Loamy Ridges
H. Loamy Creeks/Flatwoods
I. Poorly Drained Sandy Ridges
J. Bonneau Beach
K. Santee Loamy Ridges
L. Well Drained Side Slopes/Flats
0
5
10
Miles

Table B-3. **LTA criteria and analysis for the Francis Marion National Forest.**

LTAs	Loamy Ridges/Flats	Swamps	Flatwoods	River/Creek Bottoms	Sandy Ridges/Side Slopes	Swampy Flats
Land Surface Form						
Predominant Topography	Nearly level loamy ridges and upland flats	Level swamps and bays	Nearly Level flats and bays	Level floodplains and terraces	Rolling ridges, moderate sideslopes and bays	Swamps and upland flats
Slope Range	0–4%	0–2%	0–4%	0–2%	2–10%	0–2%
Ratio of streams to upland	Not computed, high ratio of streams to uplands	Not computed, low ratio of streams to uplands	Not computed, high ratio of streams to uplands	Well defined drainage, wetlands a dominant feature	Very well defined drainage, sinkholes and scattered ponds	Not computed, low ratio of streams to uplands
Streams Waterbodies	More defined drainage, wetlands, waterbodies not a dominant feature	Very few defined streams, scattered ponded areas	Some defined drainage, few waterbodies	Well defined drainage, wetlands a dominant feature	Very well defined drainage, sinkholes and scattered ponds	Very few defined streams, scattered ponded areas
Soil Drainage	Somewhat poorly to poorly	Very poorly	Poorly and very poorly	Poorly and very poorly	Moderately well, well and somewhat poorly	Poorly
Geology						
Time Period	Pleistocene	Holocene	Pleistocene	Holocene	Pleistocene	Holocene
Surface Geology Formation	Backbarrier and river deposits sandy loam, loam clay loam	Swamp deposit sand, loam, sandy loam	Backbarrier and river deposits sandy loam, loam	Swamp and river deposits, clay loam, sandy loam	Beach deposit, loamy sand, sand, sandy loam	Swamp deposits, loams, loamy sand
Parent Material	Muddy fine sand, clay and sands	Muck and clean fine sands	Clean fine sand	Muck and clean fine sand	Clean fine sand	Muck and clean fine sand
Vegetation						
Overstory	Loblolly, longleaf, bottomland hardwoods (mixed hardwoods)	Swamp hardwoods, brush and loblolly	Loblolly and swamp hardwoods and swamp hardwoods	Bottomland hardwood and swamp hardwood	Longleaf, loblolly and upland hardwood landtype–pond pine included	Loblolly & swamp hardwood

Analysis of the Management Situation

A summary of the *Analysis of the Management Situation* follows.

Background

Hurricane Hugo, the eighth named storm of the 1989 Atlantic Hurricane season, struck near Sullivan's Island, South Carolina, about 11:00 PM eastern standard time on September 21, 1989. Estimated maximum sustained wind at landfall was 138 miles per hour. The center of the eye passed within 5 miles of the Forest. Hugo took its place in history as the largest disaster ever suffered on any National Forest in the system.

Statewide, the hurricane caused 35 deaths and injured several hundred people in 23 South Carolina counties. Property damage within the Palmetto State exceeded $6 billion. About 1.8 million ha. of forest land were damaged by wind and water. The amount of dead and downed wood was three times the annual harvest in the state. An estimated 6.7 billion board feet of sawtimber were damaged or destroyed (SC Forestry Commission).

Summary of Resource Damage

Developed Recreation

All recreational areas on the Forest providing camping, picnicking, boating, or rifle range facilities received extensive damage to structures and vegetation. Most of the picnic tables, grills, fire rings, vehicle barriers, shelters, signs and chemical toilets were damaged beyond repair.

Dispersed Recreation

All trails on the Forest received heavy damage. The 102 miles of trails, hiking, horseback, motorcycle and canoe, were blocked by fallen trees and debris.

Wilderness

Wambaw Swamp and Little Wambaw Swamp were in the direct path of the storm and suffered severe blowdown. These areas contained many large hardwood trees susceptible to windthrow.

There was moderate blowdown in Hell Hole Bay. This area contains mostly small trees with lower canopy heights which lessened the susceptibility to wind damage.

Wambaw Creek lies north of the main winds, and blowdown was minor.

Visual Quality

Generally, the scenic value of a forest can be linked to the abundance of large trees. If this link is accepted, then it can be said that the scenic value of the Forest has been greatly reduced. A great number of the large trees, those with little capacity to bend, were broken and salvaged. Smaller trees, more capable of bending, remain in a leaning position. In many areas, the large quantity of lost timber has resulted in the complete loss of the sense of forest.

Cultural Resources

The tidal surge along the Intracoastal Waterway stripped away soil exposing archeological sites normally protected by soil overburden. Exposed sites compromised site integrity and increased the threat of vandalism from collectors. Several sites, including Seewee Shell Ring which is listed in the *National Register of Historic Places*, were adversely impacted.

Uprooted trees damaged sites by exposing them to additional degradation.

Soils

The storm caused a tidal surge between the Intracoastal Waterway and US Highway 17 that caused shoreline erosion and increased the soil salinity. Some pines and hardwoods died in the Buck Hall Campground area from the salty water.

The storm uprooted large, shallow-rooted pines and hardwoods exposing the mineral soil. However, soil movement was minimal due to the flat terrain.

Salvage operations and removing debris from ditches caused an increase in soil disturbance and compaction.

Water

There are no known long–term changes following Hugo. Short–term changes included increases in groundwater and stream flow in response to lower transpiration rates. Also the duration and extent of flooding in wetland areas occurred because of drainage blockage and lower transpiration.

Land Status

Hugo destroyed most of the landlines on the Forest.

Roads

Dense blowdown blocked over 600 miles of Forest roads. All roads closed by storm debris were reopened, and drainage was restored following the hurricane.

Fire

Hurricane Hugo changed the physical appearance of the Forest and the fuel model from a clean Fuel Model 7 to a combination of Fuel Models 7 and 11. As a result of Hugo, the fuel bed is very flammable, capable of maintaining a rapid rate of spread very resistant to control. The large boles of the trees on the ground, often prevent the use of the traditional tractor plow as the suppression tool.

Law Enforcement

Violation Notices issued for illegal dumping of trash and debris increased immediately following the hurricane. The tidal surge stripped away the soil covering archaeological sites along the Intracoastal Waterway, and some sites have been vandalized.

Integrated Pest Management

In the fall and winter of 1989, Ips bark beetle populations and blue stain fungi built up in the slash and downed timber. Drought conditions prevailed the following spring and summer (1990) which predisposed the young pine plantations to the tremendous populations of Ips. Spots of up to 15 acres were scattered across the Forest by mid-summer. After the fall rains, the Ips populations declined.

Southern pine beetle (SPB) populations reached outbreak status by the spring of 1990 and lasted through the summer. The longleaf pine had been stressed by Hugo and subsequent drought to the point that beetle attack was successful. As the longleaf recovered from the stress, the number of SPB infestations declined.

Timber

About 60 percent, or 92,500 acres, of pine received heavy or moderate damage. Most of the damage was in trees over 40 years old.

Based on samples of large sawtimber sized trees taken on the ground and from aerial photographs in the zone of greatest wind damage (Hook and others), about 43 percent of the bottomland hardwood species were broken, about 43 percent were uprooted, and about 14 percent were left standing with minor damage.

Threatened and Endangered Species

The red-cockaded woodpecker population decreased by 63 percent from 1,900 to about 700 birds. Active clusters decreased by 35 percent with 302 active clusters. The average clan size is 1.5 birds, down 60 percent from pre-hurricane time.

American swallow-tailed kite—population is stable at approximately 60 birds.

Bald eagle—both nests have been rebuilt after destruction by Hugo, one on Forest Service and one on private land.

Plant species—contract work done by Dr. Richard Porcher shows little direct affect from Hugo.

Wildlife

Hurricane Hugo severely impacted much of the habitat for many wildlife species.

Conditions that Significantly Changed

Age Class Distribution

To understand how age class distribution changed, one must first look at the damage caused by Hugo. The hurricane damage was classified using the following criteria:

Heavy	Basal area of remaining stand averaged less than 30. Thirty percent of all dominant trees in the stand were leaning more than 40 degrees.
Moderate	Basal area of remaining stand averaged between 30 and 60. Twenty percent or more of dominant trees in the stand were leaning more than 40 degrees.
Light to None	Varied from little to no damage in stand.

Table B-4 lists the percentage of damage to the pine type by these categories.

Since the heavy damage category represents almost complete removal of the dominant tree canopy, all of the acres in the heavily damaged stands were added to the 0-10 year age class. The stand's condition and visual appearance are more accurately reflected in this age class. Hardwood species were also damaged. Hardwoods appear in three forest types: (1) mixed loblolly pine-hardwood type (loblolly pine, sweetgum, southern red oak, white oak and red maple); (2) mixed bottomland hardwood type (cherrybark oak, swamp chestnut oak, sweetgum, red maple, water oak willow oak, Shumard oak, blackgum, yellow poplar and laurel oak); (3) and creek and muck swamps (baldcypress and water tupelo). Based on samples of large sawtimber sized trees taken on-the-ground and from aerial photos in the zone of greatest wind damage (Hook and others), about 43 percent of the bottomland hardwood species were broken, about 43 percent were uprooted, and about 14 percent were left standing with minor damage. Large-crowned, shallow-rooted species such as oaks were generally uprooted. Species with smaller crowns or more extensive root systems, such as sweetgum, usually broke or suffered some crown damage, leaving them as growing stock and as a source of seed and sprouts. Baldcypress and water tupelo suffered minimal crown damage and little breakage leaving them as growing stock and as a source of seed and sprouts. Baldcypress and water tupelo suffered minimal crown damage and little breakage leaving most of the creek and muck swamps intact. Data from younger, smaller trees showed the same type of damage pattern as that among larger, older hardwood trees.

Table B-4.	Damage by category.
Damage Class	% of Pine Damaged
Light	42
Moderate	19
Heavy	39

Summary of Findings:

1. Sixty percent, or about 92,500 acres, of pine received heavy or moderate damage.

2. Pine age class distribution changed to primarily the 0-10 year age class.

3. About 43 percent of the bottomland hardwood species were broken and 43 percent were uprooted.

Allowable Sale Quantity

Before the hurricane, the Forest was offering about 46 million board feet annually. Based on estimates following the hurricane, about 1 billion board feet of pine and hardwoods were damaged. This is roughly the amount of timber the Forest would have offered in 20 years. To date, only about 300 million board feet have been salvaged.

Based on the Forest Inventory and Analysis Work Unit's survey, pine and hardwood growing stock was reduced 55 and 20 percent respectively. The sawtimber component of the growing stock is estimated to have been reduced by 65 percent for pine and 25 percent for hardwood. Current estimates of pine and hardwood growing stock are 155 MMCF and 140 MMCF, respectively.

Summary of Findings:

The ASQ can no longer be met.

Impacts on Forest Revenues to Counties

Counties receive 25 percent of the receipts from the sale of timber, fees from campgrounds and royalties from mineral leasing on Federal lands within the county. Most receipts come from the sale of timber. As a result of the hurricane, receipts are estimated to be reduced by 90 percent beginning in 1991.

Summary of Findings:

The 25 percent of the receipts from the sale of timber to Berkeley and Charleston counties will be reduced by about 90 percent.

Populations of Proposed, Endangered, Threatened and Sensitive Species (PETS)

Before Hugo, populations of proposed, endangered, threatened and sensitive species were stable to increasing based on population monitoring done from 1986 to 1989. The hurricane impacted all plants and animals to some extent, but the most significant change was in the red-cockaded woodpecker populations.

Summary of Findings:

1. The red-cockaded woodpecker population decreased by 63 percent, and we now have about 700 birds. Active clusters decreased by 35 percent with 313 active clusters. The average clan size is 1.5 birds, down 60 percent from pre-hurricane time.

2. There were two bald eagle nests, one on Forest Service land and one on private. The bald eagles rebuilt both nests after the hurricane.

3. Swallow-tailed kites nest in mature loblolly pines located near wetlands. The hurricane damaged or destroyed the large, older trees severely impacting their habitat. Although the population is stable at 60 birds, the long-term effects are unknown.

Wildlife Habitat

The hurricane severely impacted much of the habitat for many wildlife species. Following the hurricane, the habitat condition for selected management indicator species was inventoried. The short and long–term effects varied by species.

Summary of Findings:

1. Turkey—the Forest is less suitable for turkeys because of the loss of mast and other components. There are additional nesting sites in the downed woody material now; however, as the vast area affected by Hugo begins to close canopy, nesting sites as well as brood habitat and year-round feeding areas will decline rapidly.

2. Deer—the removal of the canopy continues to stimulate browse in areas impacted by Hugo. As most of the regeneration reaches crown closure, quality of habitat will decline. Hard–mast production on the Forest has been reduced drastically. Losses in mast are being offset by increases in evergreen and semi-evergreen shrubs and vines.

3. Quail/bluebird—the hurricane improved the quality and quantity of habitat for quail and bluebird.

4. Pine Warbler/red-eyed vireo—the quality and quantity of habitat have declined.

5. Squirrels—the quality and quantity of habitat have declined.

6. Wood Duck—hard mast food supply has been reduced.

Acres Classified as Wetlands

The original Plan classified 37,650 acres as wetlands; currently, the Forest is classifying approximately 140,000 acres as potential wetlands. Although the definition the Forest uses for wetlands has remained the same since the last planning period, the method of inventory or wetland delineation has changed. Wetlands were formerly delineated solely by working group and included the pond pine and swamp hardwood working groups. The pond pine working group included the following forest types: (18) pond pine—hardwood; (36) pond pine; and (40) hardwood—pond pine. The swamp hardwood working group consisted of forest types (67) bald cypress—water tupelo and (68) sweetbay—swamp tupelo—red maple. (For a more detailed discussion, reference the Forest Land Management Planning records 1920, folder IV—1: Inventory [Capability Areas], 1981—85.) We now base potential wetland inventory on hydric soils.

Other factors responsible for the large increase in acreage was the *Federal Manual for Delineating Jurisdictional Wetlands* (1981) and a change in the hydric soil definition. This change added several soil series to the national hydric soils list. The Forest currently uses an intensive inventory approach by identifying wetlands. Hydric soils that are identified in county soil maps are used for broad planning purposes, and site specific verification is used as needed for project work. Hydric soils are defined as soils which are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper region of the soil (USDA Soil Conservation Service 1987). Soil series listed as hydric are found in *Hydric Soils of the United States* (1987) and are listed in a more site-specific manner, by county, in the "Technical Guide—South Carolina" (USDA-SCS 1989). The Forest will periodically consult the Corps of Engineers (CE), Environmental Protection Agency (EPA) and the Coastal Council to be sure it is meeting responsibilities in wetlands.

Summary of Findings:

The increase in acreage may significantly impact the degree or intensity of future management activities.

Results of Monitoring

The Forest Plan was monitored from 1986 until the hurricane struck in 1989. This section discusses only the monitoring done prior to Hugo.

Plan implementation was on track with some exceptions. Timber sales were only 70 percent of the volume planned for the first 4 years of implementation. This deviation was caused by three factors:

1. Hardwood markets did not develop as planned.

2. Commercial thinnings did not materialize as planned, and only 34 percent of the commercial thinning acres were thinned.

3. The impacts of red-cockaded woodpecker requirements were not fully anticipated causing a shortfall in regeneration of pine stands.

There was a shortfall in accomplishing the wildlife targets. However, the fish habitat improvement target was exceeded due to the national initiative for fisheries.

Road construction targets were exceeded by 44 percent. Road reconstruction targets were exceeded by 14 percent. Land exchange and land line location were below target levels due to a lack of funding.

Improvements should be made in the methods used to monitor Plan implementation. Many monitoring items are stated in the form of standard Management Attainment Report (MAR) activities. In many cases, this is a poor measure of Plan implementation. For instance, non-structural wildlife habitat improvement includes prescribed burning and developing and maintaining wildlife openings.

Resource Potential

Letters and telephone calls from the public, along with field contacts, show increased demands for developed and dispersed recreation and wilderness use. The 1985 AMS predicted this increase. Although the Forest is still offering the same recreational activities, some minor shifts in participation by recreational activity are occurring. The demand has increased for horseback riding trails, and mountain biking has become more popular. Hunting on the Forest continues to be popular. However, there is a shift toward hunting big game rather than small game. The demand for fishing is increasing faster than the demand for hunting. A strong, competitive timber market still exists. The 12 major purchasers for stumpage in 1985 are still in business today. Consumptive water uses on the Forest, such as municipal or industrial withdrawals, are limited. Supply continues to exceed demand.

Formulating, Estimating Effects and Evaluating Alternatives

Development of Management Requirements

Management requirements are directed toward producing a viable level of resources for both the short and long term. The requirements stem from the NFMA as interpreted by the implementing regulations, 36 CFR 219.27. The following sections of 219.27 contain the basic direction for management requirements:

a. Resource Protection
b. Vegetative Manipulation
c. Silvicultural Practices
d. Even-aged Management
e. Riparian Areas
f. Soil and Water
g. Diversity

Most of the management requirements are accomplished by using standards and guidelines incorporated into applicable management area prescriptions. Management requirements can also be met by analyzing and constraining the FORPLAN model such as dictating specific allocations or timing. Spatial arrangement of FORPLAN solutions can be analyzed through GIS to determine if management requirements are met. In some cases, compliance with minimum management requirements (MMRs) depends on site–specific situations and information. The allocation and schedule developed with the FORPLAN model will assure that certain minimum requirements are met. The ultimate determination of whether the minimum management requirements are met will depend upon systematic and frequent monitoring of the Forest Plan. Some requirements can only be met through monitoring. For example Section 219.27 (c)(5). Monitoring will also be used to ensure compliance with the standards and guidelines.

The following table displays a key work summary of each management requirement specified in 36 CFR 219.27 and how compliance is assured in the analysis process. Monitoring is a part of all sections, but is only listed when it is a primary method of analysis.

CFR Reference		Key Work Summary	Method of Addressing MMRs
219.27	**(a)**	**Resource Protection**	
	(1)	Conserve soil and water	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions
	(2)	Minimize Hazards from wind, flood, fire and erosion	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions
	(3)	Control pests	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions Management Area Prescriptions
	(4)	Protect streams, stream-banks, lakes, and wet-lands	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions
	(5)	Provide for and maintain diversity	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions Common Constraints by Goals
	(6)	Maintain viable fish and wildlife populations	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions Viable Population Analysis
	(7)	Assess Prescriptions for potential impacts	GIS Analysis of FORPLAN Solutions Project Development and Planning FORPLAN Analysis and Solutions
	(8)	Protect critical habitat for threatened and endan-gered species	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions Management Area Prescriptions GIS Analysis of FORPLAN Solutions Regional Guidelines
	(9)	Designate ROW corridors	Standards and Guidelines
	(10)	Road design appropriate for planned uses	Standards and Guidelines Project Development and Planning Management Area Prescriptions

CFR Reference	Key Work Summary	Method of Addressing MMRs
(11)	Reestablish vegetative cover within ten years of road construction	Standards and Guidelines Project Development and Planning Management Area Prescriptions
(12)	Maintain air quality	Standards and Guidelines Project Development and Planning Management Area Prescriptions

219.27(b) Vegetative Manipulation

(1)	Prescription best suited to multiple-use goals	Management Area Prescriptions Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions
(2)	Assure land can be adequately restocked	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions Management Area Prescriptions
(3)	Prescription not chosen primarily due to dollar return or greatest timber output	FORPLAN Analysis and Solutions Other values and timing options included and considered
(4)	Consider effects on residual trees and adjacent stands	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions Timber Yield Tables and Activity Costs GIS Analysis of FORPLAN Solutions
(5)	Avoid permanent impairment of site and conserve soil and water	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions
(6)	Prescriptions have desired effect on resources	Standards and Guidelines Project Development and Planning FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions
(7)	Be practical in terms of transportation, harvest requirements, and costs	FORPLAN Analysis and Solutions Project Development and Planning GIS Analysis of FORPLAN Solutions Management Area Prescriptions

219.27(c) Silvicultural Practices

(1)	No harvest on non-suited land except salvage or to meet non-timber objectives	Standards and Guidelines FORPLAN Analysis and Solutions Constraint for non-suited areas Project Development and Planning Management Area Prescriptions

CFR Reference	Key Work Summary	Method of Addressing MMRs
(2)	Timber sale schedule gives allowable sale quantity for each period	FORPLAN Analysis and Solutions Nondeclining yield Constraint
(3)	Cut only if restocking assured in five years	Standards and Guidelines Project Development and Planning Management Area Prescriptions
(4)	Cultural treatments for multiple-use or to promote crop tree growth	Management Area Prescriptions Project Development and Planning
(5)	Decrease harvest levels if intensified management practices cannot be completed	Monitoring
(6)	Even-aged cutting protect resource values	Project Development and Planning FORPLAN Analysis and Solutions Management Area Prescriptions
(7)	Use silvicultural treatment to prevent pest damage	Project Development and Planning
219.27(d) Even-aged Management		
(1)	Located openings to achieve desired multiple-use objectives	Standards and Guidelines FORPLAN Analysis and Solutions GIS Analysis of FORPLAN Solutions
(2)	Clearcut size limits	Standards and Guidelines GIS Analysis of FORPLAN Solutions
219.27(e) Riparian Areas		Standards and Guidelines Project Development and Planning GIS Analysis of FORPLAN Solutions
219.27(f) Soil and Water		Standards and Guidelines Project Development and Planning GIS Analysis of FORPLAN Solutions
219.27(g) Diversity		Standards and Guidelines Management Area Prescriptions GIS Analysis of FORPLAN Solutions

Timber Resource Land Suitability

36 CFR 219.14 directs that during the forest planning process, lands which are not suited for timber production shall be identified. Lands identified within the following categories are considered not suited for timber production:

1. Not forest land

2. Technology not available to ensure timber production without irreversible resource damage to soils productivity, or watershed conditions.

3. Not reasonable assurance that land can be adequately restocked within 5 years of harvest.

4. Land has been withdrawn from production by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

Areas identified on the Francis Marion National Forest within these four categories are displayed in Table B-5.

Table B-5. Lands meeting one of the four requirements of CFR 219.14 on FMNF.

	Acres
1. **Non-forest**	
Water	825
Unproductive	5,933
Permanent Land Development Administrative Sites	20
Developed Recreational Sites	169
Seed Orchard	686
Road Rights-of-way	135
Total Non-forest	**7,768**
2. **Technology Lacking**	0
3. **Restocking Assurance Lacking**	0
4. **Land Withdrawn**	
Wilderness Areas	13,812
Santee Experimental Forest	6,053
Guilliard Lake Research Natural Area	23
Sewee Shell Mound Archaeological Site	264
Total Land Withdrawn	**20,152**
Total Lands Unsuitable	**27,920**

Tentatively Not Appropriate for Timber Production

In addition to lands which meet the four categories for unsuitability, additional areas may be tentatively identified as not appropriate for timber production to meet objectives of an alternative if (1) land is proposed for uses which preclude timber production, (2) other objectives limit timber production such that the minimum management requirements in CFR 219.27 cannot be met, or (3) lands are not cost-efficient in meeting forest objectives over the planning horizon. Alternatives which identify lands in these three categories of tentatively not appropriate for timber production will be identified with the unsuitable lands discussed above as "Not Suited for Timber Production."

Several areas regardless of alternative have been identified as not appropriate for timber production due to previous designations. These are displayed in Table B-6.

Table B-6.	**Lands designated as not appropriate for timber production in all alternatives.**
RCW Clusters	4,270
RCW Replacement/Recruitment Stands	5,000
Progeny Areas	33
Guilliard Lake Scenic Area	1,041
Cedar Hill Island	802
The Battery	39
Watahan Plantation	393
Blue Springs	6
Big Ocean Bay	333
Other Botanical Areas	601
I'on Swamp	1,520
Honey Hill Limesink (Proposed RNA)	210
Tibwin Plantation	577
Total Acres	**14,825**

Based on the objectives of the alternatives considered, additional lands have been designated as not appropriate for timber production. They are displayed under the "varied" row in Table B-7. A general breakdown of this "Varied" category by alternative follows: Alternative A–remainder of Forest; Alternative B–additional wildlife openings; Alternative C–scattered old growth areas and additional wildlife openings; Alternative D–all of management area 23; and Alternative F–additional wildlife openings and a portion of management area 29. Table B-7 also summarizes Tables B-5 and B-6. An economic analysis revealed no additional areas should be removed from the suitable lands. (See B-38, Stage II analysis.)

Table B-7. **Summary of the acres designated as unsuitable for timber production, not appropriate for timber production common to all alternatives and varied among alternatives.**

	Alternatives				
	A	B	C	D	C
Total Forest	249,503	249,503	249,503	249,503	249,503
Unsuitable	27,920	27,920	27,920	27,920	27,920
Not Appropriate for Timber Production					
Common to All	14,825	14,825	14,825	14,825	14,825
Varied	206,758	810	3,561	13,415	5,937
Total not Suited for Timber Production	**249,503**	**43,555**	**46,306**	**56,160**	**48,682**
Total Suited for Timber Production	**0**	**205,948**	**203,197**	**193,343**	**200,821**

Social and Economic Impact Analysis

A Computer model called IMPLAN was used to estimate income and employment effects on the economic impact area of the Forest. IMPLAN is an input/output model developed for use in estimating direct, indirect and induced employment and income effects due to Forest Service activities and expenditures. Economic impacts result from Forest outputs being sold, users of the Forest spending their incomes, and the Forest Service purchasing goods and services form the local economy. Timber harvest volumes, Forest Service budget projections, and recreation-visitor-day projections for both developed and dispersed recreation were fed into the model.

IMPLAN's data base contains the economy of each county by economic sector. Data includes the dollar size and employment of each sector. Data also includes activity of the transactions of each sector with all the other sectors. For example: for each $1.00 of sales, the sawmill sector might spend $.47 for logs, $.10 for labor, $.05 for electricity, etc. Based on the economic structure of the Berkeley, Charleston, Dorchester, and Georgetown counties area, job and income response coefficients were developed, considering 223 different market sectors. Response coefficients, displayed in Table B-8, are multiplied by resource outputs by alternative to estimate employment and income effects.

Table B-8. IMPLAN Response Coefficients

Activity	Coefficient	
	Jobs	Income $ M
Pine Sawtimber MMBF	9.93	227.35
Pine Poletimber MMBF	4.38	116.26
Budget $MM	24.37	586.66
25% Fund $MM	24.25	593.84
Developed Recreation		
Water	1.01	22.73
Other	.79	16.81
VIS	.79	16.81
Dispersed Recreation		
Wilderness	1.08	27.69
Hunt/Fish	.42	10.03
Other	.66	16.49

Economic Structure

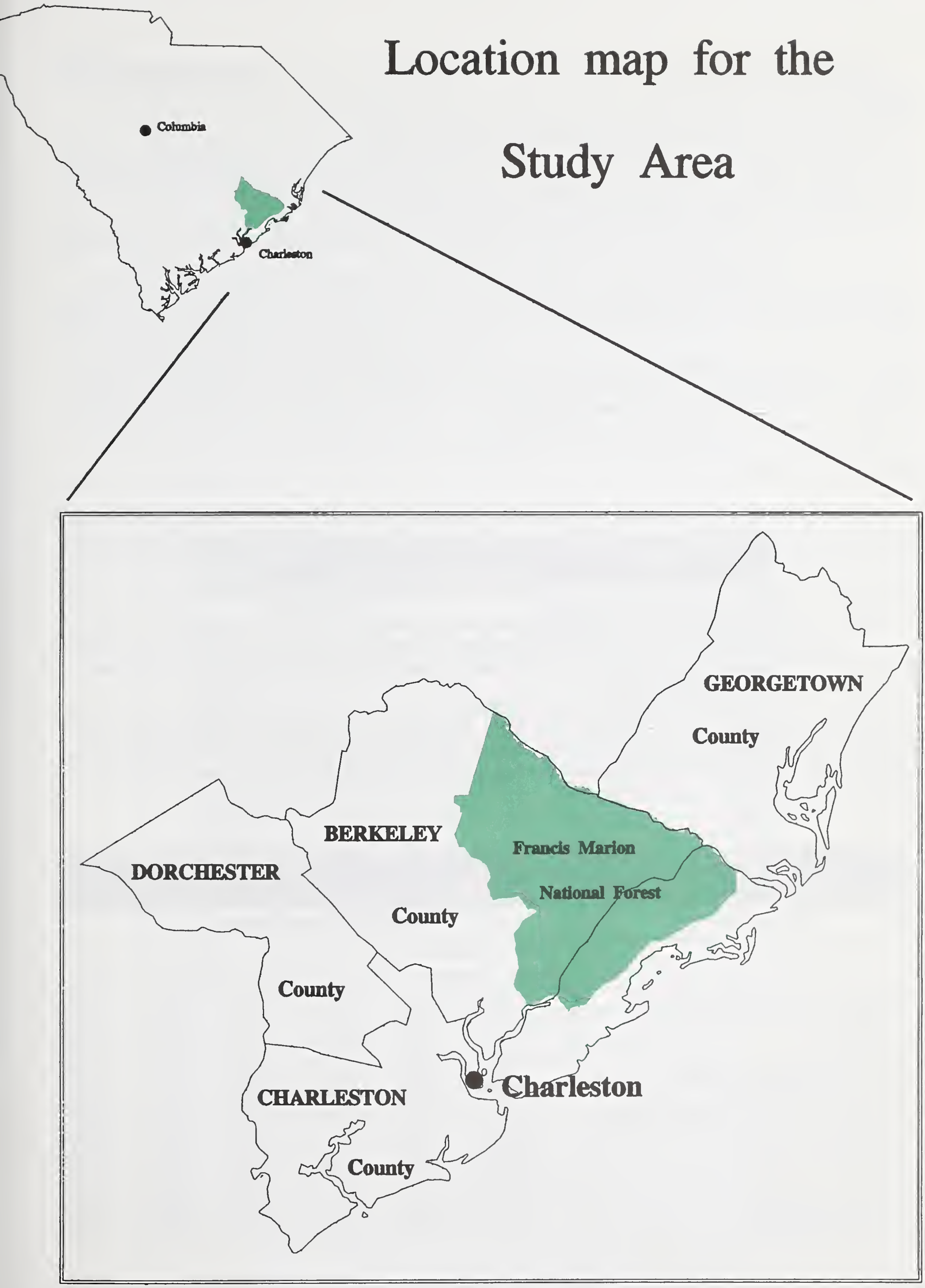
The structure of an economy and its relationship with the forest resource are important perspectives a Forest needs as it develops a Plan. Input-output models, such as IMPLAN, have been used as a tool to help understand the structure of an economy. In this analysis, the IMPLAN analysis framework is used to examine the economic diversity and dependency of the Forest impact area. Economic diversity addresses the existence and magnitude of different sectors (economic activity) and dependency addresses the existence and magnitude of exports by sector. The analysis is directed at helping to provide an understanding of the economy in which the forest functions.

The Forest impact area is endowed with a relatively abundant forest resource. The extent to which the local economy (existence and magnitude of sectors and exports) reflects this natural resource setting is of special interest. The existence, magnitude and dependency on exports of forest resource related sectors gives some indication of the impacts changes in forest resource activities would be expected to have on these sectors and the economy in general.

Economic stability and growth are desirable characteristics for which economies strive. The more diverse an economy, within the available resources, the more stable it becomes over the long run. Economic activity can be broken down into production for exports, referred to as the economic base component, and production for local use, the service component. The economic base activity is the dominant force that brings new monies into the economy. Characteristics of the basic economy are relevant to the local economy's growth potential. These two economic characteristics, stability and growth, can have negative interactions. Heavy emphasis on growth in a particular industry reduces diversity but may provide substantial exports and stimulate growth and development. If the industry uses resources in limited supply or new technology causes the industry to become obsolete, the economy's prosperity may be short lived. Over emphasis on diversity can lead to a relatively stable economy which stagnates and lacks the vitality needed for growth and development. The discussion presented is not intended to imply any preference for a specific level of economic diversity or dependency, only to delineate the current situation.

Economic base theory is used to define economies which evolve around metropolitan areas. Such a delineation by the Department of Commerce establishes Charleston and Georgetown, South Carolina, as two functional economies which include most of the land area around the Forest. Such a delineation has a demand orientation and represents the geographical origin of many consumers involved in consumption of forest resource outputs. In the case of timber, there may be several intermediate processing steps before the final demand is produced (sawmill, paper mill, transport, construction, wholesale, retail, etc.). In the case of other outputs, they may be consumed or participated in on the Forest (recreation, hunting, firewood gathering, etc.), but the consumer may reside many counties or even states away.

Location map for the Study Area



When these demand–oriented centers are used to define the impact area, the impact to the local economy involved in the forest-related production may be very diluted and appear inconsequential. Such a perspective is not very informative regarding the impacts of forest resource activity changes on the production and primary processing of timber and the local service oriented business supporting forest visitors (supply side orientation).

A supply–side orientation was used to define the local rural economy that is expected to be most heavily impacted from changes in forest resource related activities. Counties with National Forest lands and adjacent counties considered to be relatively dependent upon forest resource activities (processing facilities, sales of inputs for forest production activities or services for forest visitors) were the basis for defining the Forest impact area.

The impact area used in the analysis is composed of four contiguous counties; Berkeley, Charleston, Dorchester and Georgetown. The proximity of these counties is shown on the location map.

The impact area delineated represents an area economy that interacts directly with the supply of forest resource outputs and production activities. Primary processing facilities for timber stumpage are included but the place of origin of many forest visitors is not. This delineation provides a useful framework for looking at diversity and dependency of the local economy in which the Forest functions. (See location map.) Some expenditures by forest visitors tend to support economic activity at their place of residence which may be considerably removed from the forest's main area of influence. The extent to which these visitors spend money in the impact area and support local businesses is evident in the impact area data and thus included. The expenditures related to Forest visits at the place of residence, if outside the study area, is generally much less significant to that economy.

Economic Diversity

Economic diversity addresses the number of sectors in a study area and the distribution of economic activity within these sectors. The level of economic activity in each sector is measured for several characteristics–total income, employment, exports, final demand, value added and industrial output. A sector's importance may vary considerably between these characteristics. For example, a sector could have 10 percent of the total employment and only 3 percent or less of each other characteristic.

Income or employment diversity would probably be the more representative single indicator, but all are included here because each characteristic provides an additional perspective. Exports, final demand and value added are components of industrial output and give additional detail. For example, exports would normally be expected to have heavy concentration in the manufacturing sector.

The U. S. economy is represented in the IMPLAN model with 528 sectors. In this 4-county impact area there are 223 sectors. This represents a sector density index of .422 for the Forest. Experience with this type of measure is very limited, but for an area of this size the index is in the average to above average range. Thus, the economy appears to be relatively diverse. A perspective of the distribution by major sector grouping for the six diversity characteristics is shown in Table B-9.

Table B-9. Diversity characteristics by major sector (expressed as percent).

Major Sector	Diversity Characteristics					
	Total Income	Employment	Final Exports	Value Demand	Ind. Added	Output
Agriculture, Forestry, Fish	1.17	1.76	1.99	1.35	1.14	1.42
Mining	0.05	0.04	0.10	0.06	0.05	0.05
Construction	5.42	7.36	0.06	8.52	5.16	7,86
Wood & Paper Manufacturing	3.94	2.80	9.39	5.99	3.79	6.36
Other Manufacturing	11.91	9.15	30.47	20.38	11.94	19.62
Transportation, Communications, Utilities	5.96	4.21	4.37	5.02	6.11	7.48
Wholesale, Retail Sales	10.20	14,05	9.25	11.12	11.91	11.11
Services	24.90	30.01	14.60	22.64	25.87	24.53
Government Enterprise	1.02	1.54	1.14	1.38	0.95	1.65
Government Industry	35.44	29.09	28.61	23.52	33.08	19.92

Economic Dependency

Export base analysis is a well–established regional analysis technique for estimating an economy's dependency on exports. This is not to imply that the only opportunity for economic development and growth is through exports, but that exports are a significant factor in this process.

Economic dependency is defined to address the income and employment associated with the basic economy (direct, indirect and induced) in total and by sector. In this section the income and employment associated with the basic economy (export base) were examined from a slightly different perspective. The income and employment estimates are developed from income and employment multipliers and total exports (domestic and foreign).

A measure of economic dependency is represented as the percentage of income and employment that is associated with the basic economy. Further, a perspective of the economic dependency on a particular sector can be determined from individual sector information. Due to differences in labor intensity, and possible other factors, the ranking can be different between income and employment. It would be possible for a change in a specific activity to have substantive impacts on either income or employment in the local economy, but not the other.

In the Forest study area 61 percent of the value of production for final demand are exported. The total income associated with the basic economy (production for exports) is 72 percent of total income for the area. The employment associated with this production (direct, indirect and induced) is 71 percent of total employment.

The production of exports is heavily concentrated in the government industry sector (42 percent of income and 37 percent of employment). The distribution of income and employment associated with the basic economy by major sector is shown in Table B-10.

Table B-10. Dependency characteristics by major sector (expressed as percent).

Major Sector	Dependency Characteristics	
	Total Income	Employment
Agriculture, Forestry, Fish	1.98	2.12
Mining	0.10	0.09
Construction	0.00	0.00
Wood & Paper Manufacturing	5.73	4.42
Other Manufacturing	20.18	16.68
Transportation, Communications, Utilities	3.74	3.87
Wholesale, Retail Sales	9.64	12.78
Services	15.84	22.34
Government Enterprise	0.40	0.57
Government Industry	42.39	37.13

A total of 18 sectors have more than 1 percent of the basic sector's income or employment, and only 3 sectors have more than 5 percent. A summary of these sectors is shown in Table B-11.

Table B-11. Economic dependency by market sector (expressed as percent).

Market Sector	Income Impact	Employment Impact
Forestry Products	1.183	0.745
Paperboard Mills	4.212	2.864
Cement, Hydraulic	1.028	0.595
Primary Aluminum	5.624	4.572
Internal Combustion Engines	1.997	1.244
Navy Ship Building & Repairing	1.044	0.981
Motor Freight Transport and War	1.051	1.115
Water Transportation	1.820	2.122
Wholesale Trade (other than recreation)	2.233	2.320
Retail Trade (other than recreation)	6.955	9.815
Real Estate	1.849	1.286
Hotels and Lodging Places	1.098	1.710
Engineering, Architectural Service	1.218	0.962
Eating and Drinking Places	2.564	4.857
Automobile Repair and Services	0.879	1.145
Doctors and Dentists	1.330	1.002
Household Industry	1.628	3.113
Government Industry	42.388	37.134

Summary and Conclusions

A supply–side orientation was used to establish an impact area to analyze the overall economy and the forest resource related sectors within which the Forest functions. The economy was found to be relatively diverse which suggests above average stability.

Five sectors were identified as key sectors in the study area economy. They represent the area of greatest concentration from an economic dependency perspective, and a significant part (approximately 60 percent of income and employment) of the export base of the area. The five sectors are:

Paperboard Mills
Primary Aluminum
Retail Trade
Eating and Drinking Places
Government Industry

One of the more important sectors thought to be forest–resource related and having more than 4 percent of the income and almost 3 percent of the employment in the dependency analysis was Paperboard Mills. Given the concentration of forest resource related sectors found in the analysis and the role of National Forest system lands to the total forest resource base, changes in National Forest resource outputs are not expected to cause heavy impacts on the local economy. The economy's relationship with the forest resource does suggest, however, some direct impacts would be expected.

The natural environment influences an area's attractiveness for tourism, location of the manufacturing sector, etc. The forest resource is a major component of this setting, and how it is managed could influence this relationship. No attempt was made in this study to evaluate this relationship.

Forest Planning Model

FORPLAN, Version II, was the analytical tool used in the analysis. Version II was selected due to the ease of data entry and greater capability and versatility over that of the Version I model used for the original Forest Plan. FORPLAN was used to analyze numerous management area prescriptions and activity schedules and their potential for achieving the objectives of each alternative.

FORPLAN, a "linear program" model, is designed to simulate the actions of the different resources, management, and environmental conditions on the Forest. It is also designed to find the "optimum" solution to a problem posed by the potentials and limitations of the land and resources, the effect of costs, budgets, and resource prices, and the desired objectives of resource yields and environmental conditions.

The FORPLAN model is structured to seek the greatest economic efficiency (the most return for an investment), which is represented as a "maximize PNV" objective function. ("PNV" or "present net value" is the current net value of the estimated flow of present and future monetary costs and benefits.) FORPLAN can estimate Forest-wide effects, monetary costs and benefits under the conditions specified to achieve the objectives of a particular alternative.

The ID team was directly involved with the design, operation, and interpretation of the FORPLAN model. Using the identified analysis areas, appropriate management practices and associated mathematical expressions, the ID team constructed the Forest model.

In the FORPLAN Model, the outputs modeled were chosen because of their relationship to the issues, concerns and opportunities. Other outputs and effects were estimated outside of the FORPLAN model or by interpreting the results of the FORPLAN solution.

The linear program is driven by the objective function which is achieved or satisfied, subject to a series of constraints. As the term indicates, constraints are conditions or restrictions that determined which course of action can or cannot be adopted. In a linear programming problem, conditions or restrictions defined by constraints are satisfied prior to optimization of the problem in the manner specified by the objective function. If a course of action that satisfies all of the constraints does not exist, the problem is infeasible. In this case, the constraints must either be relaxed or re-formulated or the problem re-defined to allow an optimal solution to be found. In the FORPLAN model, constraints were imposed for several reasons. There were constraints imposed to satisfy legal and policy related requirements. Examples of these are the nondeclining yield constraint (policy) and constraints to provide habitat for the red-cockaded woodpecker. There can also be discretionary constraints imposed in order to achieve the objectives that define an overall management philosophy or alternative.

FORPLAN simulates the physical characteristics of the land, the activities used to manage that land, and the outputs, costs and benefits associated with the activities. The land base is represented by analysis areas, allocation and scheduling choices are offered to analysis areas in the form of management prescriptions. Output (yield) and cost/benefit coefficients are contained in resource yield tables and economic tables respectively. The primary components of the FORPLAN model include analysis areas, management prescriptions, resource yield tables, economic tables, objective function and constraints.

Wildlife in the Model

The first step in developing wildlife coefficients to be used in FORPLAN was to compile information on habitat requirements for each species. This information came from various references including literature and local expert biologists as well as university personnel and Forest Service personnel. Coefficients were developed for each species based on age class of the vegetation and forest cover type. Ten year age classes were used; however, the first ten year period was broken into 0-5 and 6-10 years. Forest types were grouped into 8 working groups: loblolly pine, longleaf pine, pond pine, upland hardwood, swamp hardwood, bottomland hardwood, mixed pine/hardwood, and brush. Each species has a separate write-up of its biology and a matrix of the coefficients which includes a brief narrative that explains the rationale for selecting the coefficient (see process records).

After the base line coefficients were developed for each species, age class, and working group, the coefficients and their matrices were sent out to experts (universities, SE research stations, SCWMRD biologists and Forest Service biologists) for critical review. Once the comments were received necessary adjustments to the coefficients were made. These coefficients were then employed in the FORPLAN model.

Wildlife and Fish User Days (WFUDs) were also calculated for the big game species, deer and turkey, and the small game species, squirrel and quail. WFUDs are twelve-hour user days and are calculated using (1) the percentage of the population that can be harvested on a sustained yield, (2) the number of days it takes to harvest one animal, and (3) the number of hours spent in each day of hunting. The values are: deer–2.62 WFUDs, turkey–2.22 WFUDs, squirrel–0.092 WFUDs, and quail–0.104 WFUDs. WFUD price values for big game and small game were taken from the "Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program." The value for big game is $33/WFUD and small game is $34/WFUD. These values were incorporated in the FORPLAN model and used in optimizing present net value of the alternatives.

Timber Outputs

The FORPLAN models for the Francis Marion LMP revision allocates timber management prescriptions to analysis areas and calculated the Allowable Sale Quantity (ASQ). These analysis areas consist of the southern yellow pine stands available for timber management as described by 6 level identifiers:

1) Proximity to RCW cluster and Management Area delineation
2) Hurricane damage assessment
3) Soil wetness
4) Tree species
5) 10-year age class
6) Site productivity

NOTE: The Level 1 identifier varies by alternative. All other identifiers remain consistent for all alternatives.

Level 1: Alternative A

TM = All pine stands except in management areas 1-9.

Level 1: Alternative B

Suited pine stands were divided into 4 categories based upon their proximity to an un-destroyed or re-habilitated RCW cluster (whether active or inactive):
12 = Loblolly stands within 1/2 mile of an RCW cluster.
34 = Loblolly stands between 1/2 mile of an RCW cluster and the HMA boundary.
14 = Longleaf stands within the RCW HMA.
00 = Stands outside the RCW HMA.

Level 1: Alternative C

Suited pine stands were divided into 3 categories based upon their proximity to an un-destroyed or re-habilitated RCW cluster (whether active or inactive):
1 = Stands within 1/4 mile of an RCW cluster.
23 = Stands between 1/4 and 3/4 mile from an RCW cluster.
04 = Stands further than 3/4 mile from an RCW cluster.

Level 1: Alternative D

Suited pine stands were divided into 5 categories based upon their proximity to an RCW cluster and designated Management Area:
22 = Stands in Management Area 22.
23 = Stands in Management Area 23.
24 = Longleaf stands in Management Area 24.
4I = Loblolly stands in Management Area 24 within 3/4 mile of an RCW cluster.
40 = Loblolly stands in Mgt. Area 24 further than 3/4 mile from an RCW cluster.

Level 1: Alternative F

Suited pine stands were divided into 8 categories based upon their proximity to an RCW cluster and designated Management Area:
70 = Management Area 26 - outside the HMA.
74 = Management Area 26 - inside the HMA.
80 = Management Area 27 - outside the HMA.
84 = Management Area 27 - inside the HMA.
90 = Management Area 28 - outside the HMA.
94 = Management Area 28 - inside the HMA.
34 = Management Area 29 - inside the HMA (outside not modeled).

Level 2:

Stands over 20 years of age were classified as either Heavily Damaged (HD), Moderately Damaged (MD), or Lightly to not damaged (LT) according to basal area measurements conducted after Hurricane Hugo. These basal area values were used to develop appropriate yield tables for harvest of existing stands and to project thinning requirements for existing stands. Regenerated stands will then switch to regular thinning and harvest scenarios based upon management intensity.

Level 3:

Loblolly stands were classified as Well (WD), Moderately Well (MW), Somewhat Poorly (SWP), Poorly (PD), or Very Poorly (VP) drained according to a classification of properties developed by the Forest Soil Scientist. Depending on the objectives of each alternative, the SWP, PD and VP soils were grouped together under a hydric (HY) class while the W and MW were grouped under a non-hydric (NH) class. This classification was used to allocate prescriptions to achieve alternative objectives or to provide better estimates of costs, benefits or effects.

Level 4:

Forest types 31 (Loblolly Pine), 22 (Slash Pine), and 32 (Shortleaf Pine) were grouped together as Loblolly (LB) due to the limited acreage of Slash and Shortleaf. Forest type 21 (Longleaf Pine) was coded as LL. Other forest types were also coded by working group for wildlife and timber values assessed outside the allocated portion of the FORPLAN model and entered into the model as directly entered prescriptions. These groups were defined as follows:

Pond Pine - forest type 36
Upland Hardwood - forest types 50-57
Bottomland Hardwood - forest types 58-66 and 69-88
Swamp Hardwood - forest types 67, 68, 23
Mixed Pine/Hardwood - forest types 8-20 and 40-49
Brush sp. - forest types greater than 96

Level 5:

Stands were classified by 10-year age class and coded by the mid-point of each class. Code 05 represents the 0-10 age class, code 15 represents 11-20, etc. up through code 95 for the 91+ age class. For consolidation of analysis areas, all heavily damaged stands (level 2 code HD) were considered as regeneration stands and changed to age code 05. Damage code HD was then dropped.

Level 6:

Stands were classified according to their Continuous Inventory of Stand Conditions (CISC) productivity code as either High (HI) for productivity codes 1 and 2, Moderate (MD) for productivity codes 3 and 4, or Low (LO) for productivity codes greater than 4. Due to limited acreage, Loblolly stands of low productivity and Longleaf stands of high productivity were then grouped with moderate under code MD. So Loblolly has codes MD and HI. Longleaf has codes LO and MD.

Timber Management Options

A range of broad timber management options were developed for the loblolly and longleaf pine analysis areas based on their damage class, age and productivity level (site index). These options varied tree densities, amount of hardwood allowed within the area and level of stocking for regenerated stands. This range of options was developed to encompass all the Forest Plan alternatives and to provide a reasonable number of economic options for the scheduling process in FORPLAN. Five intensity levels of even-aged management and one uneven-aged management option for loblolly pine and mixed loblolly pine–hardwood, three intensity levels of even-aged management for longleaf pine, and conversions of loblolly pine to mixed pine-hardwood, mixed hardwood-pine, or longleaf pine were developed. Variables for intensity levels included initial tree stocking per acre at establishment, trees per acre at age 3, trees per acre at age 10, trees per acres at age 25, hardwood component at age 10 and basal area at age 25. For example, high intensity loblolly pine prescriptions would have 545 trees per acre at establishment, 10 percent hardwood component and 90 percent survival at age 10. (For specific details on intensity levels see process record 300-5-1.)

Yield estimates for each option were made with growth and yield models. PLNTYLD and NATYLD models were used for the even-aged options for loblolly and mixed stands while NATYLD alone was used for longleaf pine. Uneven-aged management for loblolly was modeled using SINGLE model. (For additional information on the growth and yield models used see process record 300-5-1 and 300-5-4) The yield estimates and their associated costs and benefits were entered into the FORPLAN model.

Management options were selectively made available to be applied to appropriate analysis areas to be considered in the FORPLAN solution based on the objectives and desired conditions of the alternatives. Different options were also made available within specific management areas of an individual alternative. Consideration of availability of the management options was significantly affected by an analysis areas proximity to a red-cockaded woodpecker cluster and the red-cockaded woodpecker forest-wide management strategy. Timing choices for thinnings and final harvest were also varied within options to achieve desired conditions.

Following is a discussion by alternative and management area for the options made available and the intent of their availability. The intent is preceded by *.

Alternative A

Management Areas 16 - 20

Loblolly Pine

MD and WD, AGE 1. Convert to Longleaf (13,979 acres). Go to LL Mod.Productivity Regen. Tables. Future management same as Longleaf below.

* Convert loblolly stands 0-10 years old on moderately well and well drained sites to longleaf pine. Will occur 1st period by use of presc. fire and plant.

MD and WD, AGE 2+. Convert to Longleaf beginning 4th period at rate of 3,240 acres per period. Minimum harvest age 50 years. Go to LL Mod. Prod. Regen. Tables.

* Convert loblolly stands currently 11 years and older on moderately well and well drained sites to longleaf. Conversion is delayed until the 4th period to achieve retention of oldest 1/3 stands for RCW habitat.

SP and HY. Beginning period 4, harvest at 6.7 percent rate per period (R=150). Minimum harvest age 100 years. Intensities 1-3 available.

* Manage existing loblolly pine on some-what-poorly and hydric soils on a 150 year rotation at low intensities. Objective is to perpetuate RCW habitat while achieving a relatively low disturbance objective.

Longleaf Pine

Beginning period 4, harvest at 5 percent rate per period (R=200). Minimum harvest age 150 years. All intensities available.

* Manage existing longleaf and loblolly stands which were converted to longleaf on a 200 year rotation. Objective is to perpetuate RCW habitat while achieving a relatively low disturbance objective.

*Note: Conversion acres for MD,WD 2+ Loblolly above and harvest of existing Longleaf should not exceed 5,400 acres per period.

Alternative B

Management Area 21

Restrictions RCW HMA-Wide (Zones 1-4)-Loblolly and Longleaf - No regeneration harvests until 4th Period. -Total harvests in Loblolly will NOT exceed 8,259 acres per period. -Total harvest in Longleaf will NOT exceed 2,885 acres per period.

Loblolly Pine

W,MW, and SP, AGE 1 and 2, RCW Zones 1 and 2. Harvest at 10 percent per period rate. Minimum harvest age 35 years. All intensities available.

* Manage existing loblolly stands which are 1 to 20 years old on well, moderately well, and some-what-poorly drained sites which are within 1/2 mile of RCW cluster on a 100 year rotation for RCW, timber, and other wildlife objectives.

W,MW, and SP, AGE 3+, RCW Zones 1 and 2. Harvest at 10 percent per period rate. Minimum harvest age 100 years. All intensities available.

* Manage existing loblolly stands which are 21+ years old on well, moderately well, and some-what-poorly drained sites which are within 1/2 mile of RCW cluster on a 100 year rotation for RCW, timber, and other wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

W,MW, and SP, AGE 1 and 2, RCW Zones 3 and 4. Harvest at 10 percent per period rate. Minimum harvest age 35 years. UEAM available. All intensities available.

* Manage existing loblolly stands which are 1 to 20 years old on well, moderately well, and some-what-poorly drained sites which are greater than 1/2 mile of RCW cluster but are within the HMA on a 100 year rotation for RCW, timber, and other wildlife objectives. UEAM options are available in FORPLAN.

W,MW, and SP, AGE 3+, RCW Zones 3 and 4. Harvest at 10 percent per period rate. Minimum harvest age 100 years. UEAM available. All intensities available.

* Manage existing loblolly stands which are 21+ years old on well, moderately well, and some-what-poorly drained sites which are greater than 1/2 mile of RCW cluster but are within the HMA on a 100 year rotation for RCW, timber, and other wildlife objectives. UEAM options are available in FORPLAN. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

HY, AGE 1 and 2, RCW Zones 1-4. Harvest at 10 percent per period rate. Minimum harvest age 35 years. All intensities available.

* Manage existing loblolly stands which are 1 to 20 years old on hydric soils which are within the RCW HMA on a 100 year rotation for RCW, timber, and other wildlife objectives. UEAM options are not available in FORPLAN due to soils.

HY, AGE 3+, RCW Zones 1-4. Harvest at 10 percent per period rate. Minimum harvest age 100 years. All intensities available.

* Manage existing loblolly stands which are 21+ years old on hydric soils which are within the RCW HMA on a 100 year rotation for RCW, timber, and other wildlife objectives. UEAM options are not available in FORPLAN due to soils.

Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

W,MW, and SP, RCW Zone 0. Harvest at 20 percent rate. Minimum harvest age 35 years. UEAM available. All intensities available.
 * Manage existing loblolly stands on well, moderately well, and some-what-poorly drained sites which are outside of the RCW HMA on a 50 year rotation for timber and wildlife objectives. UEAM options are available in FORPLAN.

HY, RCW Zone 0. Harvest at 20 percent rate. Minimum harvest age 35 years. All intensities available.

 * Manage existing loblolly stands on hydric soils which are outside of the RCW HMA on a 50 year rotation for timber and wildlife objectives. UEAM options are not available in FORPLAN due to soils.

Longleaf Pine

AGE 4+, RCW Zones 1-4. Harvest at rate of 8.5 percent per period. Minimum harvest age is 120 years.

 * Manage existing longleaf stands 31+ years old within RCW HMA on a 120 year rotation for RCW habitat, timber and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

AGE 1-3, RCW Zones 1-4. Minimum harvest age is 45 years. Harvest at rate of 8.5 percent per period. Minimum harvest age is 45 years.

 * Manage existing longleaf stands 1 to 30 years old within RCW HMA on a 120 year rotation for RCW habitat, timber and wildlife objectives. RCW Zone 0. Harvest at rate of 17 percent (R=60). All intensities available. Minimum harvest age is 45 years.

 * Manage existing longleaf stands outside RCW HMA on a 60 year rotation for timber and wildlife objectives.

Alternative C

Management Area (All suited lands)

Loblolly Pine

SP and NH, AGE 1, RCW Zones 0 and 4. Maintain 9,909 acres (SP-6,140 and MD-3,769) in an open condition until period 4 (to provide early successional habitat).

* Maintain existing stands of loblolly 1 to 10 years old on well, moderately well, and some-what-poorly drained soils in a early successional stage (0-3 years) outside of the RCW HMA (greater than 3/4 miles from RCW cluster) to meet wildlife objectives. Area is maintained in this condition through period 2, then regenerated during period 3. The area will move into the 11 to 20 year age class beginning the 4th period.

NH, RCW Zone 1. Convert to Longleaf beginning 4th period at 8.5 percent rate per period. Minimum harvest age 120 years. Go to LL Moderate Prod. Tables.

 * Convert all existing loblolly stands on well and moderately well drained soils to longleaf within 1/4 mile of RCW cluster for RCW habitat.

SP and HY, RCW Zone 1. No Harvest.
 * No harvest allowed within 1/4 mile of RCW cluster to meet RCW interim guides.

NH, AGE 1 and 2, RCW Zone 2-3. Convert to Longleaf beginning 4th period at 8.5 percent rate per period. Minimum harvest age 35. Go to LL Moderate Prod. Tables.
 * Convert loblolly pine 1 to 20 years old on well and moderately well drained soils greater than 1/4 mile but within 3/4 miles from RCW cluster for RCW habitat.

NH, AGE 3+, RCW Zone 2-3. Convert to Longleaf beginning 4th period at 8.5 percent rate per period. Minimum harvest age 120. Go to LL Moderate Prod. Tables.

* Convert loblolly pine 21+ years old on well and moderately well drained soils greater than 1/4 mile but within 3/4 miles from RCW cluster for RCW habitat. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

SP and HY, AGE 1 and 2, RCW Zone 2-3. Beginning 4th period harvest at 8.5 percent rate per period. Minimum harvest age 35. All intensities.

* Manage loblolly 1 to 20 years old on some-what-poorly and hydric soils greater that 1/4 mile but within 3/4 miles of RCW cluster on a 120 year rotation for RCW habitat, timber, and wildlife objectives.

SP and HY, AGE 3+, RCW Zone 2-3. Beginning 4th period harvest at 8.5 percent rate per period. Minimum harvest age 120. All intensities.

* Manage loblolly 21+ years old on some-what-poorly and hydric soils greater that 1/4 mile but within 3/4 miles of RCW cluster on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective. RCW Zones 0 and 4. Harvest available 1st period. Minimum harvest age 35. All intensities.

* Manage loblolly greater than 3/4 miles from RCW cluster for timber objectives.

Longleaf

RCW Zone 1. No Harvest.
* No harvest allowed within 1/4 mile of RCW cluster to meet RCW interim guides.

AGE 4+, RCW Zones 2-3. Beginning 4th period harvest at 8.5 percent rate per period. Minimum harvest age 120 years. All intensities.
* Manage longleaf 31+ years old greater that 1/4 mile but within 3/4 miles of

RCW cluster on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

AGE 1-3, RCW Zones 2-3. Beginning 4th period harvest at 8.5 percent rate per period. Minimum harvest age 45 years. All intensities.
* Manage loblolly 1 to 30 years old greater that 1/4 mile but within 3/4 miles of RCW cluster on a 120 year rotation for RCW habitat, timber, and wildlife objectives.

RCW Zones 0 and 4. Harvest available 1st period. Minimum harvest age 45. All intensities.
* Manage longleaf greater than 3/4 miles from RCW cluster for timber objectives.

Note: Conversions of mixed types to loblolly or hardwood types, and conversion of loblolly types to hardwoods as directed in the current alternative is considered outside of model. All current mixed forest types in MA 21 are converted to hardwood types to portray this intent.

Alternative D

Restrictions Forest-wide
-Loblolly and Longleaf - No regeneration harvests until 4th Period.

* To meet 0-30 year age class distribution per RCW guidelines.
-Total harvests in Loblolly (not counting conversions to LL) will NOT exceed 8,247 acres per period.
-Total harvest in Longleaf (including conversions of Lob. to LL) will NOT exceed 6,200 acres per period.

Management Area 22

Loblolly Pine

W and MD drained, Current Age Class (AGE) 1 - Prescribe Burn 5,394 acres 1st period to convert to LL. Go to LL Mod.Prod. Regen. Tables.

* Convert loblolly pine 1 to 10 years old on well and moderately well drained soils to longleaf primarily by use of prescribe fire to meet mgt. area longleaf and wildlife objectives.

W and MD drained, AGE 1 and 2. Convert to LL at 8.5 percent rate. Minimum harvest age 35 Go to LL Mod. Prod. Regen. Tables.

* Convert loblolly 1 to 20 years old on well and moderately well drained soils at a 120 year rotation rate for RCW and longleaf objectives.
W and MD drained, AGE 3+. Convert to LL at 8.5 percent rate. Minimum harvest age 120. Go to LL Mod. Prod. Regen. Tables.

* Convert loblolly 21+ years old on well and moderately well drained soils at a 120 year rotation rate for RCW and longleaf objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.
SP drained, AGE 1. Prescribe burn 3,546 acres to delay establishment.

* Prescribe burn loblolly 1 to 10 years old on some-what-poorly drained soils to achieve wildlife objectives.

HY and SP drained, AGE 1 and 2. Harvest at 10 percent per period rate. Minimum harvest age 35.

* Manage loblolly 1 to 20 years old on some-what-poorly and hydric soils on a 100-year rotation for RCW, timber, and wildlife objectives.
HY and SP drained, AGE 3+. Harvest at 10 percent per period rate. Minimum harvest age 100.

* Manage loblolly 21+ years old on some-what-poorly and hydric soils on a 100 year rotation for RCW, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

Longleaf

AGE 1,2 and 3. Harvest at rate of 8.5 percent per period. Minimum Harvest age 45 years.
* Manage longleaf 1 to 30 years old on a 120 year rotation for RCW, timber, longleaf and wildlife objectives.

AGE 4+. Harvest at rate of 8.5 percent per period. Minimum Harvest age 120 years.

* Manage longleaf 31+ years old on a 120 year rotation for RCW, timber, longleaf and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

Management Area 23

Loblolly

AGE 1 and 2. Harvest at 6.7 percent rate (R=150). Minimum harvest age 100 years. Intensities 1,2, and 3.

* Manage loblolly 1 to 20 years old on a 150 year rotation at low intensities.
Objective is to provide for sustained RCW habitat while achieving a low disturbance objective.
AGE 3+. Harvest at 6.7 percent rate (R=150). Minimum harvest age 150 years. Intensities 1,2, and 3.

* Manage loblolly 21+ years old on a 150 year rotation at low intensities.
Objective is to provide for sustained RCW habitat while achieving a low disturbance objective. Stands are not harvested

until at least 150 years old to meet oldest 1/3 RCW retention objective.
Longleaf

AGE 1,2, and 3. Harvest at 5 percent rate (R=200). Minimum harvest age 150 years. Intensities 1 and 2.

* Manage longleaf 1 to 30 years old on a 200 year rotation at low intensities.
Objective is to provide for sustained RCW habitat while achieving a low disturbance objective.

AGE 4+. Harvest at 5 percent rate (R=200). Minimum harvest age 200 years. Intensities 1 and 2.

* Manage longleaf 31+ years old on a 200 year rotation at low intensities.
Objective is to provide for sustained RCW habitat while achieving a low disturbance objective. Stands are not harvested until at least 200 years old to meet oldest 1/3 RCW retention objective.
Management Area 24

Loblolly

W and MD drained, Current Age Class (AGE) 1, RCW Zones 1,2,and3. Prescribe Burn 806 acres 1st period to convert to LL. Go to LL Mod.Prod. Regen. Tables.

* Convert loblolly 1 to 10 years old on well and moderately well drained soils
within 3/4 miles of RCW cluster to longleaf for RCW and other wildlife objectives.

SP, W, and MD drained. RCW Zones 0 and 4. Uneven-aged Prescriptions. (7,017 acres.)
* Manage loblolly on some-what-poorly, well, and moderately well drained soils greater that 3/4 miles from RCW cluster under uneven-aged management (UEAM) methods to achieve UEAM and RCW objectives.

SP drained, AGE 1, RCW Zones 1,2,and3. Prescribe burn 4,701 acres to delay establishment.

* Prescribe burn loblolly 1 to 10 years old on some-what-poorly drained soils within 3/4 miles of RCW cluster for wildlife objectives.
AGE 1 and 2. Harvest at 10 percent rate. Minimum harvest age 35 years.

* Manage loblolly 1 to 20 years old on a 100 year rotation for RCW habitat, timber, and wildlife objectives.

AGE 3+. Harvest at 10 percent rate. Minimum harvest age 100 years.

* Manage loblolly 21+ years old on a 100 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

Longleaf

AGE 1,2 and 3. Harvest at rate of 8.5 percent per period. Minimum Harvest age 45 years.

* Manage longleaf 1 to 30 years old on a 120 year rotation for RCW habitat, timber, and wildlife objectives.
AGE 4+. Harvest at rate of 8.5 percent per period. Minimum Harvest age 120 years.

* Manage longleaf 31+ years old on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

Alternative F

Restrictions RCW HMA-Wide (Zones 1-4)
-Loblolly and Longleaf - No regeneration harvests until 4th Period.

* To meet 0-30 year age class distribution per RCW guidelines.

-Total harvests in Loblolly (not counting conversions to LL) will NOT exceed 6,422 acres per period.
-Total harvest in Longleaf (including conversions of Lob. to LL) will NOT exceed 4,446 acres per period.
Management Area 26

Loblolly Pine within RCW zones 1-4

NH, Current Age Class (AGE) 1 - Prescribe Burn 4,446 acres 1st period to convert to LL. Go to LL Mod.Prod. Regen. Tables.

* Convert loblolly pine 1 to 10 years old within RCW HMA on well and moderately well drained soils to longleaf with prescribed burning for future RCW habitat and wildlife objectives.

HY and SP, AGE 1 - Prescribe burn 6,422 acres 1st period. (change AGE to O).

* Prescribe burn loblolly 1 to 10 years old on some-what-poorly and hydric soils within the RCW HMA for wildlife objectives.

NH, AGE 1 and 2 - Convert to LL at 8.5 percent rate. Go to LL Mod. Prod. Regen. Tables.

* Convert loblolly 1 to 20 years old on well and moderately well drained soils within the RCW HMA to longleaf at a 120 year rotation rate of harvest for RCW habitat, timber, and wildlife objectives.

HY and SP, AGE 1 and 2 - Harvest at 10 percent per period rate. Minimum harvest age 35.

* Manage loblolly 1 to 20 years old on some-what-poorly and hydric soils within the RCW HMA on a 100 year rotation for RCW habitat, timber, and wildlife objectives.

NH, AGE 3+ - Minimum harvest age is 100 years. Harvest at rate of 8.5 percent per period and convert to LL. Go to Mod. Prod.

* Convert loblolly 21+ years old on well and moderately well drained soils within the RCW HMA at a 100 year rotation rate of harvest for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

HY and SP, AGE 3+ - Minimum harvest age is 100 years. Harvest at rate of 10 percent per period.

* Manage loblolly 21+ years old on hydric and some-what-poorly drained soils within the RCW HMA on a 100 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

Longleaf Pine within RCW zones 1-4

AGE 4+ - Minimum harvest age is 120 years. Harvest at rate of 8.5 percent per period.

* Manage longleaf 31+ years old on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

AGE 1-3 - Minimum harvest age is 45 years. Harvest at rate of 8.5 percent per period.
* Manage longleaf 1 to 30 years old on a 120 year rotation for RCW habitat, timber, and wildlife objectives.

Loblolly Pine outside HMA (zone 0)

NH, Current Age Class (AGE) 1 - Prescribe Burn 2890 acres 1st period to convert to LL. Go to LL Mod.Prod. Regen. Tables.

* Convert loblolly 1 to 10 years old on well and moderately well drained soils outside the RCW HMA to longleaf by use of prescribed burning for longleaf and wildlife objectives.
NH - Convert to LL. Mod Prod. Minimum harvest age 35. Harvest at rate of 14 percent per period. (70 year R)

* Convert loblolly on well and moderately well drained soils outside the RCW HMA to longleaf at a 70 year rotation rate of harvest for longleaf, timber, and wildlife objectives.

HY and SP - Harvest at rate of 17 percent per period. Minimum harvest age 35.

* Manage loblolly on hydric and some-what-poorly drained soils outside the RCW HMA on a 60 year rotation for timber and wildlife objectives.

Longleaf pine outside HMA (zone 0)

Minimum harvest age is 45 years. Harvest at rate of 14 percent per period.

* Manage longleaf outside the RCW HMA on a 70 year rotation for timber and wildlife objectives.

Management Area 27

Loblolly within HMA AGE 3+ -

Minimum harvest age 100 years. Harvest at rate of 10 percent per period.

* Manage loblolly 21+ years old on a 100 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

RCW zones 2-4, AGE 1 and 2 - Harvest at rate of 10 percent per period. Allow intensities of 1, 2, or 3. (Represents a conversion to pine-hardwood.)

* Manage loblolly 1 to 20 years old greater than 1/4 mile from RCW cluster but within the RCW HMA on a 100 year rotation at low intensities of management for RCW, wildlife (hard mast increase), and timber objectives. Only lower intensities available to reflect higher level of hardwood component within pine stands.

RCW zone 1, AGE 1 and 2 - Harvest at rate of 10 percent per period. Allow intensities of 5 and 4.

* Manage loblolly 1 to 20 years old within 1/4 mile of RCW cluster on a 100-year rotation at relatively high intensities of management for RCW habitat. High intensities available to reflect higher component of pine for RCW.

Longleaf within HMA AGE 7+ -
Minimum harvest age is 120 years. Harvest at rate of 8.5 percent per period.

* Manage longleaf 61+ years old within RCW HMA on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

AGE 1-6 - Minimum harvest age is 45 years. Harvest at rate of 8.5 percent per period.

* Manage longleaf 1 to 60 years old within RCW HMA on a 120 year rotation for RCW habitat, timber, and wildlife objectives.

Loblolly outside HMA

All - Convert to Mixed. Minimum harvest age 75. Harvest at rate of 8.5 percent per period.

* Convert loblolly outside RCW HMA to mixed hardwood-pine at a 120 year rotation rate of harvest. No harvest until age 75 years old to allow advanced reproduction to become established.

Longleaf outside HMA All - Minimum harvest age is 45 years. Harvest at rate of 8.5 percent per period.

* Manage longleaf outside RCW HMA on a 120 year rotation for longleaf, timber, and wildlife objectives.
Management Area 28

Loblolly within HMA AGE 2+ -

Minimum harvest age 100 years. Harvest at rate of 10 percent per period.

* Manage loblolly 11+ years old within RCW HMA on a 100 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 100 years old to meet oldest 1/3 RCW retention objective.

NH and SP, AGE 1 - Prescribe burn 8000 acres 1st period. (Change AGE to 0).

* Prescribe burn loblolly 1 to 10 years old on well, moderately well, and somewhat-poorly drained soils for wildlife objectives.

AGE 1 - Minimum harvest age 45. Harvest at rate of 10 percent per period.

* Manage loblolly 1 to 10 years old within RCW HMA on a 100 year rotation for RCW habitat, timber, and wildlife objectives.

Longleaf within HMA AGE 4+ -

Minimum harvest age 120 years. Harvest at rate of 8.5 percent per period.

* Manage longleaf 31+ years old within RCW HMA on a 120 year rotation for RCW habitat, timber, and wildlife objectives. Stands are not harvested until at least 120 years old to meet oldest 1/3 RCW retention objective.

AGE 1-3 - Minimum harvest age 55. Harvest at rate of 8.5 percent per period.

* Manage longleaf 1 to 30 years old within RCW HMA on a 120 year rotation for RCW habitat, timber, and wildlife objectives.

Loblolly outside HMA

NH and SP, AGE 1 - Prescribe burn 1300 acres 1st period. (Change AGE to 0).

* Prescribe burn loblolly 1 to 10 years old on well, moderately well, and somewhat-poorly drained soils for wildlife objectives.

NH and SP - Allow model to select either uneven-aged management or even-aged management (even-aged harvests at rate of 17 percent per period and intensities 1 and 2 with minimum harvest age of 45).

* Manage loblolly outside RCW HMA with low intensity even-aged management or UEAM methods for wildlife and timber objectives. Even-aged management will be on a 60 year rotation.

HY - Minimum harvest age 45. Harvest at rate of 17 percent per period.
* Manage loblolly on hydric soils outside RCW HMA on a 60 year rotation for timber and wildlife objectives.

Longleaf outside HMA

All - Minimum harvest age 55. Harvest at rate of 14 percent per period.
* Manage longleaf outside RCW HMA on a 70 year rotation for timber and wildlife objectives.
Management Area 29

Loblolly inside HMA

AGE 2+ - Minimum harvest age is 150 years. Harvest at rate of 6.7 percent per period, with regen. intensities of 1,2, or 3.

* Manage loblolly 11+ years old inside RCW HMA on a 150 year rotation at low intensities. Objective is to perpetuate RCW habitat while achieving low disturbance objective. Stands are not harvested until at least 150 years old to meet oldest 1/3 RCW retention objective.

AGE 1 - Minimum harvest age is 100 years. Harvest at rate of 6.7 percent per period, with intensities of 1,2, or 3.

* Manage loblolly 1 to 10 years old inside RCW HMA on a 150 year rotation at low intensities. Objective is to perpetuate RCW habitat while achieving low disturbance objective.

Longleaf inside HMA

AGE 3+ - Minimum harvest age is 200 years. Harvest at rate of 5 percent per period, with intensities of 1 or 2.

* Manage longleaf 21+ years old inside RCW HMA on a 200 year rotation at low intensities. Objective is to perpetuate RCW habitat while achieving low disturbance objective. Stands are not harvested until at least 200 years old to meet oldest 1/3 RCW retention objective.

AGE 1-2 - Minimum harvest age is 150 years. Harvest at rate of 5 percent per period, with intensities of 1 or 2.

* Manage longleaf 1 to 20 years old inside RCW HMA on a 200 year rotation at low intensities. Objective is to perpetuate RCW habitat while achieving low disturbance objective.

Loblolly and Longleaf outside HMA

Min. Level Management

* No management activities scheduled to achieve low disturbance objective.

Constraints for Benchmarks, Alternatives and Stage II Analysis

In all benchmark and management alternative FORPLAN models, periodic fluctuations in the timber allowable sale quantity were controlled by forest-wide constraints. According to regulations, for the base sale schedules, the planned sale for any future decade shall be equal to or greater than the planned sale for the preceding decade of the planning periods provided that the planned sale is not greater than the long-term sustained-yield capacity consistent with the management objectives of the alternative (219.13(D)(1)(i)). The long-term sustained-yield capacity (LTSYC) is defined as "the highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives" (NFMA reg 219.3). LTSYC is potential average growth. Each prescription for an analysis area could contain a different management intensity for timber, and, therefore, a different LTSYC coefficient. The regulation requirement is met by combining the nondeclining yield option of the allowable sale constraint with a requirement that the ASQ be at or below the LTSYC in the last period (Period 10 for the Francis Marion models). Under nondeclining yield, the planned ASQ can never fall. Since the ASQ is kept below LTSYC in the last period, it must remain below it in all periods.

NFMA regulations also require that each sale schedule shall provide for a forest structure that will enable perpetual timber harvest which meets the principle of sustained yield and multiple-use objectives of the alternative (219.13(D)). This requirement has been met by applying a perpetual timber harvest constraint to the models. This constraint ensures that the forest contains as much timber inventory volume in the last period as a forest would have, on the average, under the management intensities selected in the analysis.

As part of the timber suitability process, the Stage II analysis, a basic timber-only model, describing analysis areas based on physical characteristics only (identifier levels 2-6) was run with LTSYC and perpetual harvest inventory constraints only. The non-declining, even-flow constraint was not applied to this analysis, which through a full range of management intensity and timing options, reveals the most profitable mix of prescriptions for the timber conditions present on the Forest, and the possible contribution of each analysis area to the present net value modeling objective. For the Francis Marion NF, this analysis demonstrated that all forest conditions can contribute a positive value to the timber

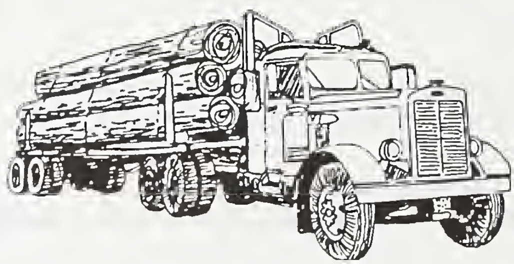


Table B-12.	Stage II analysis–contribution to PNV objective function.			
Analysis Area	Acres	Prescription	PNV /Acre	Total PNV
TM LL05LO	5148	MOD HIGH-1 THIN	0.12581	647.67
TM LL05MD	10044	MOD HIGH-2 THIN	0.20464	2055.40
TM LL15LO	1261	MOD HIGH-1 THIN	0.18989	239.45
TM LL15MD	1619	MOD HIGH-2 THIN	0.30237	489.54
TM HYLB05HI	17697	MOD HIGH-2 THIN	0.77090	13642.62
TM HYLB05MD	17405	HIGH INTENSITY-2 THIN	0.55416	9645.15
TM HYLB15HI	1641	MOD HIGH-2 THIN	1.1411	1872.55
TM HYLB15MD	2729	HIGH INTENSITY-2 THIN	0.82030	2238.60
TM NHLB05HI	11509	MOD HIGH-2 THIN	0.77930	8968.96
TM NHLB05MD	20560	HIGH INTENSITY-2 THIN	0.56256	11566.23
TM NHLB15HI	1103	MOD HIGH-2 THIN	1.1535	1272.31
TM NHLB15MD	5287	HIGH INTENSITY-2 THIN	0.83273	4402.64
TMLT LL25LO	1810	MOD HIGH-1 THIN	0.38924	704.52
TMLT LL25MD	1620	MOD LOW-NO THIN	0.37697	610.69
TMLT LL35LO	672	MOD HIGH-NO THIN	0.21709	145.88
TMLT LL35MD	290	MOD HIGH-NO THIN	0.40483	117.40
TMLT LL45LO	963	MOD HIGH-NO THIN	0.17705	170.50
TMLT LL45MD	48	MOD HIGH-NO THIN	0.20135	9.66
TMLT LL55LO	1016	MOD LOW-NO THIN	0.72483	736.43
TMLT LL55MD	1675	MOD LOW-NO THIN	0.67603	1132.35
TMLT LL65LO	816	MOD LOW-NO THIN	0.79762	650.86
TMLT LL65MD	1732	MOD LOW-NO THIN	0.91992	1593.30
TMLT LL75LO	222	MOD LOW-NO THIN	0.85617	190.07
TMLT LL75MD	172	MOD LOW-NO THIN	1.0437	179.52
TMLT LL85LO	258	MOD LOW-NO THIN	0.82571	213.03
TMLT LL85MD	571	MOD LOW-NO THIN	0.99528	568.30
TMLT LL95LO	305	MOD LOW-NO THIN	0.28879	88.08
TMLT LL95MD	145	MOD LOW-NO THIN	0.31535	45.73
TMLTHY LB25HI	298	MOD INTENSITY-NO THIN	1.0588	315.52
TMLTHY LB25MD	2107	LOW INTENSITY-1 THIN	0.62464	1316.12
TMLTHY LB35MD	369	LOW INTENSITY-NO THIN	0.45378	167.44
TMLTHY LB45HI	255	MOD INTENSITY-NO THIN	0.96241	245.41
TMLTHY LB45MD	84	HIGH INTENSITY-NO THIN	0.87515	73.51
TMLTHY LB55HI	355	MOD INTENSITY-NO THIN	1.4879	528.20
TMLTHY LB55MD	2144	HIGH INTENSITY-NO THIN	1.1614	2490.04
TMLTHY LB65HI	105	MOD INTENSITY-NO THIN	1.6334	171.51
TMLTHY LB65MD	293	HIGH INTENSITY-NO THIN	1.3701	401.44
TMLTHY LB75HI	223	MOD INTENSITY-NO THIN	1.5166	338.20
TMLTHY LB75MD	282	HIGH INTENSITY-NO THIN	1.2578	354.70
TMLTHY LB85HI	18	MOD INTENSITY-NO THIN	1.6852	30.33
TMLTNL LB85MD	75	HIGH INTENSITY-NO THIN	1.5132	113.49
TMLTNL LB25HI	1034	MOD INTENSITY-NO THIN	1.0764	1113.00
TMLTNL LB25MD	4120	HIGH INTENSITY-1 THIN	0.63810	2628.97
TMLTNL LB35HI	30	MOD INTENSITY-NO THIN	0.55702	16.71
TMLTNL LB35MD	476	HIGH INTENSITY-NO THIN	0.46724	222.41
TMLTNL LB45HI	129	MOD INTENSITY-NO THIN	1.0011	129.14
TMLTNL LB45MD	681	HIGH INTENSITY-NO THIN	0.91547	623.44
TMLTNL LB55HI	526	MOD INTENSITY-NO THIN	1.5266	802.99

Table B-12 (con't) Stage II analysis–contribution to PNV objective function.				
Analysis Area	Acres	Prescription	PNV /Acre	Total PNV
TMLTNH LB55MD	3791	HIGH INTENSITY-NO THIN	1.2017	4555.64
TMLTNH LB65HI	853	MOD INTENSITY-NO THIN	1.6721	1426.30
TMLTNH LB65MD	585	HIGH INTENSITY-NO THIN	1.4105	825.14
TMLTNH LB75HI	280	MOD INTENSITY-NO THIN	1.5553	435.48
TMLTNH LB75MD	208	HIGH INTENSITY-NO THIN	1.2981	270.00
TMLTNH LB85HI	61	MOD INTENSITY-NO THIN	1.7239	105.16
TMLTNH LB85MD	62	HIGH INTENSITY-NO THIN	1.5535	96.32
TMLTNH LB95MD	11	HIGH INTENSITY-NO THIN	1.7711	19.48
TMMD LL25LO	158	MOD LOW-1 THIN	0.21378	33.78
TMMD LL25MD	302	MOD LOW-1 THIN	0.48318	145.92
TMMD LL35LO	210	MOD HIGH-NO THIN	0.39108	82.13
TMMD LL35MD	31	MOD HIGH-NO THIN	0.41539	12.88
TMMD LL45LO	328	MOD HIGH-NO THIN	0.20052	65.77
TMMD LL45MD	299	MOD HIGH-NO THIN	0.33753	100.92
TMMD LL55LO	189	MOD LOW-NO THIN	0.60061	113.52
TMMD LL55MD	79	MOD HIGH-NO THIN	0.41184	32.54
TMMD LL65LO	316	MOD LOW-NO THIN	0.32488	102.66
TMMD LL65MD	261	MOD LOW-NO THIN	0.64350	167.95
TMMD LL75LO	232	MOD LOW-NO THIN	0.71593	166.10
TMMD LL75MD	234	MOD LOW-NO THIN	0.49604	116.07
TMMD LL85LO	420	MOD LOW-NO THIN	0.49569	208.19
TMMD LL85MD	146	MOD LOW-NO THIN	0.52225	76.25
TMMD LL95LO	126	MOD LOW-NO THIN	0.86784	109.35
TMMD LL95MD	106	MOD LOW-NO THIN	0.89440	94.81
TMMDHY LB25HI	89	MOD INTENSITY-NO THIN	0.80937	72.03
TMMDHY LB25MD	932	LOW INTENSITY-NO THIN	0.67784	631.75
TMMDHY LB35MD	615	LOW INTENSITY-NO THIN	0.67292	413.85
TMMDHY LB45HI	211	MOD INTENSITY-NO THIN	1.0617	224.02
TMMDHY LB45MD	1831	LOW INTENSITY-NO THIN	0.68348	1251.45
TMMDHY LB55HI	577	MOD INTENSITY-NO THIN	1.2185	703.07
TMMDHY LB55MD	1029	HIGH INTENSITY-NO THIN	0.81592	839.58
TMMDHY LB65HI	125	MOD INTENSITY-NO THIN	1.1220	140.25
TMMDHY LB65MD	353	HIGH INTENSITY NO THIN	0.96595	340.98
TMMDHY LB75MD	13	HIGH INTENSITY-NO THIN	1.2475	16.22
TMMDHY LB85MD	21	HIGH INTENSITY-NO THIN	1.5029	31.56
TMMDNH LB25HI	372	MOD INTENSITY-NO THIN	0.82703	307.66
TMMDNH LB25MD	3013	HIGH INTENSITY-NO THIN	0.69130	2082.89
TMMDNH LB35HI	10	MOD INTENSITY-NO THIN	0.82483	8.25
TMMDNH LB35MD	865	HIGH INTENSITY-NO THIN	0.69284	599.31
TMMDNH LB45HI	618	MOD INTENSITY-NO THIN	1.1004	680.05
TMMDNH LB45MD	981	HIGH INTENSITY-NO THIN	0.70341	690.05
TMMDNH LB55HI	286	MOD INTENSITY-NO THIN	1.2572	359.56
TMMDNH LB55MD	2059	HIGH INTENSITY-NO THIN	0.85623	1762.98
TMMDNH LB65MD	195	HIGH INTENSITY-NO THIN	1.0063	196.23
TMMDNH LB85MD	20	HIGH INTENSITY-NO THIN	1.5432	30.86
TMMDNH LB95MD	7	HIGH INTENSITY-NO THIN	1.7704	12.39
		Forest-wide Total PNV		97037.37

management program. Table B-12 shows the Stage II analysis.

Costs and Revenues for the Model

Costs and revenues were estimated for regeneration harvest sales for both even-aged and uneven-aged harvest methods and for thinning harvests. The costs were based on the 1991 TSPIRS report. Historical data was available for even-aged harvest methods and thinnings, but there were no costs available for uneven-aged harvest methods. An estimate was made for the cost of these harvests using data from the Ouachita National Forests where the costs of uneven-aged management had been compared to that of even-aged management. Elements of timber harvest costs include; sale preparation, silvicultural exams, planning, support, road maintenance, road construction, road design and sale administration. The average costs for even-aged timber harvests were estimated to be $46.29/CCF and $75.48/CCF for uneven-aged sales. The average costs for thinnings was estimated to be $20.17/CCF. The revenue values used were $238.41/MBF or $131.72/CCF for pine sawtimber and $15.00/CCF for pine small roundwood.

Costs for reforestation treatments were taken from the average costs of treatments displayed on recent sale area improvement plans. These costs were compared to recent work plans and adjusted accordingly. Total costs per acre for regeneration treatments varied from $185/acre for low intensity prescriptions to $435/acre for high intensity treatments. The costs for the treatments include release or pre-commercial thinning in some prescriptions such as natural regeneration. Both reforestation and TSI treatments would occur within the same 10–year period if needed.

Price values for recreation, big game and small game were taken from the "Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program." The value for big game is $33/WFUD and for small game is $34/WFUD. The value for camping, picnicking and swimming is $10.14/RVD, for mechanized travel and viewing scenery is $7.73/RVD, for horseback riding, hiking and water travel is $3.41/RVD and for wilderness is $20.01/RVD.

Timber Outputs

FORPLAN was primarily used to determine scheduling of timber harvests on the Forest given the objectives and constraints of each alternative. The trade-offs made among alternatives were also examined.

The objective function specifies an output to be maximized or minimized. For example, an objective function could specify the maximization of timber yield or present net value. Allocation and scheduling choices within the model are then made in accordance with the purpose stated in the objective function. The alternatives were run using maximum PNV objective functions.

Table B-13 shows the timber outputs from the model by alternative as well as benchmark outputs for maximum present net value and maximum timber output and maximum WFUD values.

Table B-13. FORPLAN results for selected periods. Timber outputs only.

Item	Max PNV	Max TBR	Alt A	Alt B	Alt C	Alt D	Alt F	Max WFUD
Period 1 (With Departure)								
Harvest								
Acres	21,832	28,378	0	2,071	3,120	0	1,374	0
MCF S/T	30,118	36,260	0	2,276	4,170	0	1,832	0
MCF P/T	1,105	2,146	0	132	200	0	101	0
Thinning								
Acres	12,092	10,760	44,147	44,147	44,147	44,147	44,147	2,744
MCF S/T	75	0	10,600	10,600	10,600	10,600	10,600	0
MCF P/T	8,833	8,392	17,700	17,700	17,700	17,700	17,700	3,027
Period 2								
Harvest								
Acres	7,151	5,863	0	717	1,560	0	1,046	0
MCF S/T	10,096	7,106	0	1,025	2,154	0	1,434	0
MCF P/T	813	2,531	0	95	318	0	200	0
Thinning								
Acres	66,084	73,398	23,788	43,500	29,647	29,415	30,313	46,193
MCF S/T	0	0	0	1,932	0	750	0	1,139
MCF P/T	42,281	60,722	16,010	25,749	19,577	19,163	20,472	37,415
Period 5								
Harvest								
Acres	38,423	36,975	0	17,352	13,810	12,886	37,634	0
MCF S/T	86,837	84,089	0	46,334	33,459	35,246	30,736	0
MCF P/T	1,736	1,608	0	570	537	321	327	0
Thinning								
Acres	16,517	27,459	44,740	40,830	32,410	40,888	37,634	44,271
MCF S/T	13,587	21,610	32,737	36,495	20,889	27,973	22,526	34,187
MCF P/T	4,549	8,223	4,869	3,321	3,554	4,799	8,469	5,348
Period 9								
Harvest								
Acres	18,825	19,857	11,015	17,352	13,194	13,026	13,233	5,096
MCF S/T	41,745	66,473	42,290	58,378	34,428	49,249	47,364	26,205
MCF P/T	900	647	140	343	356	193	259	40
Thinning								
Acres	6,560	47,277	2,115	31,905	22,470	22,919	17,285	12,678
MCF S/T	37,167	34,521	1,671	16,972	11,220	12,251	7,606	1,509
MCF P/T	26,898	13,889	93	11,026	12,433	7,553	8,213	11,780
LTSYC MCF	106,710	115,530	44,194	86,719	58,439	69,237	63,442	97,943

Wildlife and Fish User Days (WFUDs)

Table B-14 shows the Wildlife and Fish User Days for selected periods and the total over 90 years.

Table B-14. FORPLAN Wildlife and Fish User Days (WFUDs) in thousands.

				Alternative				
	Max PNV	Max Timber	Max WFUD	A	B	C	D	F
Period 1	63	61	67	64	69	69	64	61
Period 2	54	53	54	55	53	53	56	57
Period 5	53	54	64	63	61	60	62	60
Period 9	54	53	60	58	56	57	57	57
90 year total	494	486	551	540	523	532	531	523

Present Net Value (PNV)

The Present Net Value of the alternatives was estimated using the discounted costs and revenues over a 90–year planning period. Benefits included estimated timber sale receipts, wildlife and fish user day values and recreational visitor day values. The values used were those listed on page B-41. Estimated costs included the estimated budget to fully implement the alternatives. All alternatives include the cost of construction and maintenance of the Sewee Visitor Center. There are substantial costs associated with fire protection and wildlife management in relation to threatened and endangered species such as the red-cockaded woodpecker. Table B-15 shows the estimated PNV for the alternatives for various 10-year periods, compared with the assigned value PNV benchmark and the market value PNV benchmark. The assigned value benchmark used the RPA values for recreation and wildlife benefits and timber receipt values. The market value benchmark used estimated receipts for recreational use and estimated timber receipts. Currently, the Forest Service does not charge for hunting and fishing use. Indirect income is produced from wildlife management area receipts from the state.

Due to the costs of management, the high capital investment in recreation construction and the low level of timber receipts in the first few periods, the PNV is negative throughout the planning horizon in all alternatives. The benchmarks do not model any additional recreational construction. In most alternatives, receipts begin to exceed costs in the fourth period as more sawtimber volume becomes available. This positive income is not enough to recover the early negative income when discounted.

In the first 10-year period, all alternatives have a similar level of timber and wildlife benefits and costs. The recreational costs are significantly higher in alternatives B, D and F and the benefits do not increase at the same magnitude. Wildlife costs are higher than benefits in all alternatives due to the costs of managing for endangered species such as the red-cockaded woodpecker and the non-priced benefits from this management.

Recreation and wildlife costs decrease substantially in later periods. but costs exceed assigned value of benefits throughout the planning horizon for these resources in all alternatives.

Table B-15.	Net revenue and Present Net Value (PNV) in thousand $ of the alternatives.						
Period 1 (10-year Totals)							
	Alternative					**Assigned Max PNV**	**Market Max PNV**
	A	**B**	**C**	**D**	**F**		
Timber Benefits	16,617	20,292	22,141	16,618	16,617	41,261	41,538
Wildlife Benefits	2,933	2,261	2,267	2,116	2,013	2,091	0
Recreation Benefits	4,700	5,638	4,700	5,970	6,290	4,700	26
Timber Costs	5,703	7,928	8,298	6,197	6,380	20,583	20,733
Wildlife Costs	10,800	14,390	14,390	14,390	14,390	10,800	10,800
Recreation Costs	10,730	16,890	10,730	18,190	18,800	10,730	10,730
Other Costs*	20,820	27,820	27,820	27,350	26,870	8,500	8,500
Net Revenue	**-24,608**	**-38,837**	**-32,130**	**-41,423**	**-41,520**	-2,561	-9,199
PNV Cumulative	**-20,226**	**-31,921**	**-26,409**	**-34,047**	**-34,126**	-2,105	-7,561
Period 5 (10-year Totals)							
Timber Benefits	43,851	109,686	72,200	84,040	71,476	133,222	133,421
Wildlife Benefits	2,078	2,025	1,997	2,052	1,977	1,748	0
Recreation Benefits	5,365	6,843	5,365	7,000	7,355	5,365	29
Timber Costs	7,585	35,485	24,191	29,478	23,159	53,865	53,910
Wildlife Costs	11,000	10,000	10,400	9,000	8,000	9,000	9,000
Recreation Costs	7,070	7,800	7,070	8,170	9,700	7,070	7,070
Other Costs*	16,780	22,590	22,590	22,220	21,840	8,500	8,500
Net Revenue	**8,859**	**42,679**	**15,311**	**24,224**	**18,109**	61,900	54,970
PNV Cumulative	**-37,563**	**-33,336**	**-38,589**	**-47,207**	**-47,791**	28,739	13,669
Period 9 (10-year Totals)							
Timber Benefits	57,940	100,956	72,200	82,157	73,678	108,113	108,888
Wildlife Benefits	1,928	1,845	1,997	1,871	1,876	1,774	0
Recreation Benefits	5,365	6,843	5,345	7,000	7,355	5,365	29
Timber Costs	22,347	39,240	24,191	32,275	28,032	36,570	36,775
Wildlife Costs	13,000	10,000	10,400	9,000	8,000	9,000	9,000
Recreation Costs	7,070	7,800	7,070	8,170	9,700	7,070	7,070
Other Costs*	14,780	22,590	22,590	22,220	21,840	8,500	8,500
Net Revenue	**8,036**	**30,014**	**5,827**	**19,363**	**15,337**	**54,112**	**47,572**
PNV Cumulative	**-36,638**	**-26,192**	**-36,718**	**-42,416**	**-43,627**	**43,209**	**26,095**

*Other costs include fire protection, land acquisition, engineering, general administration, seed orchard operation, minerals management, law enforcement and soil and water management.

Inventory, Growth and Harvest

The following figures show the timber inventory before harvest at the mid-point of the period, the volume harvested during the period and the growth during the period on the suitable land in each alternative and the benchmarks from the FORPLAN model.

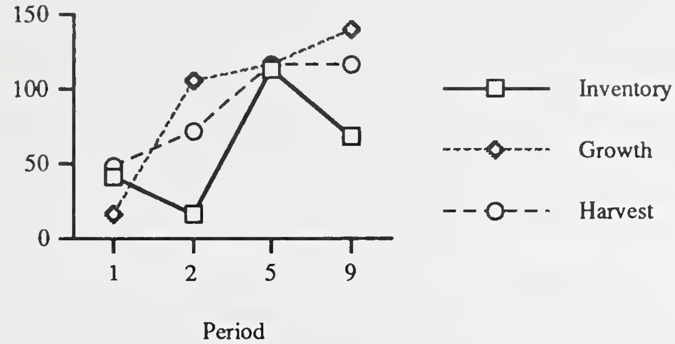


Figure B-1. Maximum timber benchmark.

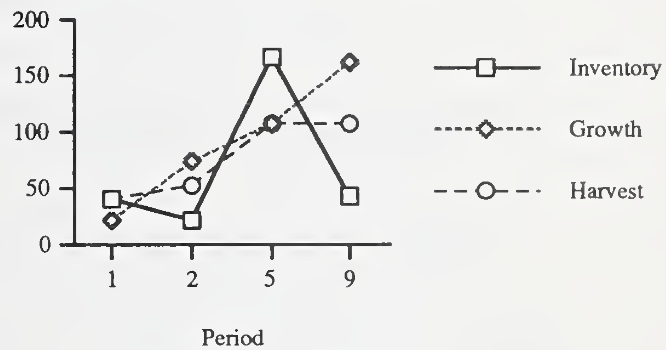


Figure B-2. Maximum PNV benchmark.

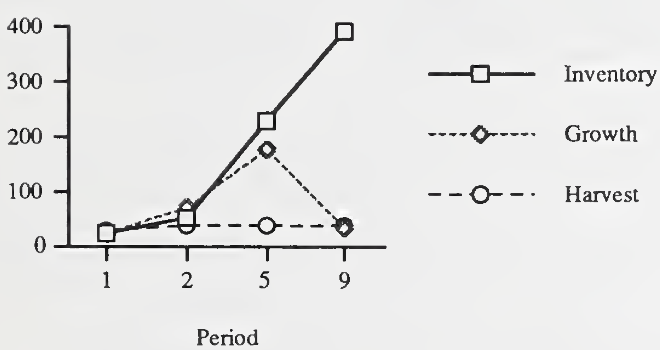


Figure B-3. Maximum WFUD benchmark.

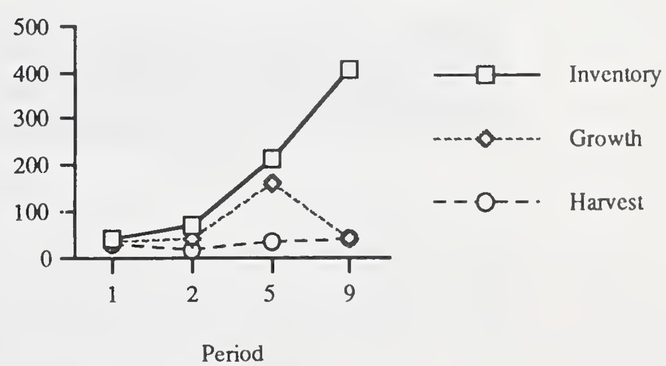


Figure B-4. Alternative A.

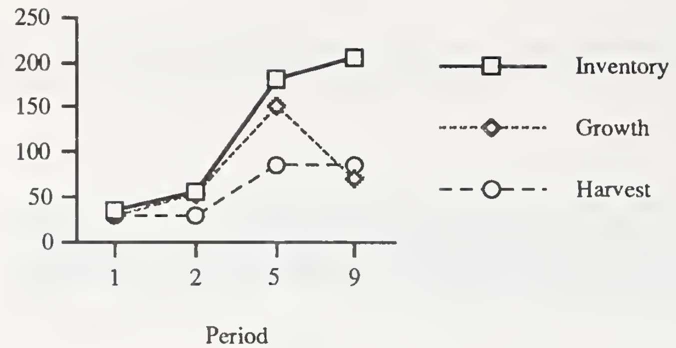


Figure B-5. Alternative B.

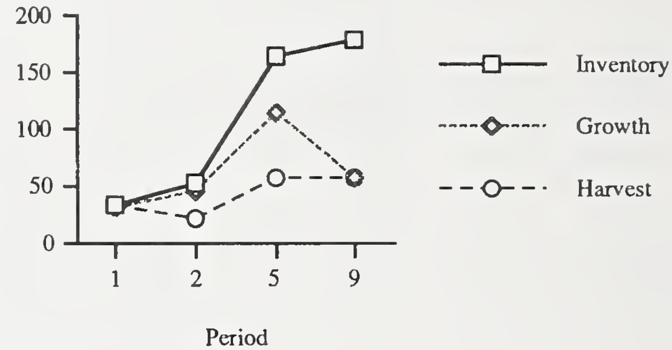


Figure B-6. Alternative C.

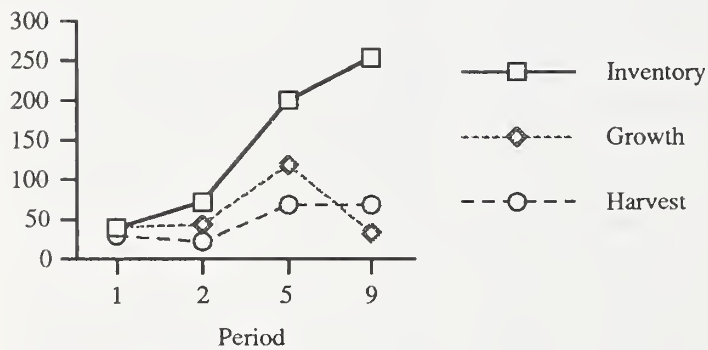


Figure B-7. Alternative D.

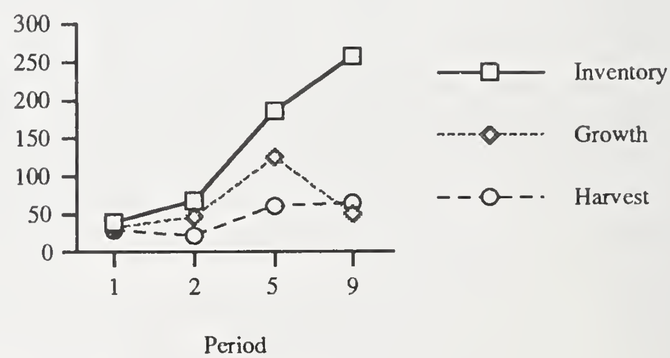


Figure B-8. Alternative F.

Departure From Base Sale Schedule

All alternatives depart from their respective base sale schedules (non-declining flow constraint) the first period. Recent surveys on the Francis Marion identified approximately 44,000 acres of loblolly and longleaf pine which now need or are projected to need thinning within the next 10 years. Initially, these areas were not selected by the FORPLAN model as probable areas to undergo thinning harvests because of the non-declining yield constraint, low economic returns, and non-uniform stand conditions. Below is a brief discussion of these areas.

Approximately 25,000 acres have been identified as needing a combination salvage and normal thinning operation. Portions of these stands received significant damage from Hurricane Hugo while other areas within the stands were undamaged. The damaged areas consist of leaning or severely destroyed canopy trees. The undamaged portions are relatively high in basal area resulting in slow growing, less vigorous trees.

Approximately 19,000 acres have been identified as needing "normal" first thinnings. Approximately one-half of this area ideally would have been thinned during the last 5 years. However, Hurricane Hugo shifted the priorities on harvesting activities to salvage type harvests which has created a backlog of thinning needs for the relatively undamaged young stands.

The timing of thinning operations is critical to maintain stand vigor. Overcrowding in young stands results in reductions in live crowns with a corresponding loss in vigor. Failure to accomplish thinnings in a timely manner has long term implications to the forest resources such as:

Stands which lose live crowns from overcrowding are slow to recover and never reach their full growth potential.

Stands which lose their vigor from overcrowding are more susceptible to insect attacks. Southern Pine Beetle attacks within these stands often move into surrounding healthy stands resulting in additional resource loss.

Failure to apply thinnings as needed will greatly delay the recovery of suitable foraging habitat and possibly cause a further decline in habitat for the red-cockaded woodpecker, Bachman's sparrow, loggerhead shrike, and Henslow's sparrow.

Failure to apply thinnings as needed may delay or cause a further decline in nesting habitat (large pine trees along bottomlands) for the swallow-tailed kite.

Failure to apply thinnings as needed results in suppression of understory vegetation for other wildlife habitat. Increased sunlight to the forest floor will stimulate and improve the quality of foraging habitat for many wildlife species.

In accordance with 36 CFR 219.16 (a)(3), allowing a departure from the non-declining yield principle would lead to better attainment of the overall objectives of multiple-use management and significantly reduce high mortality losses, thereby facilitating future sustained yield. No effect on future ASQ levels is expected as a result of allowing these departures in the first decade.

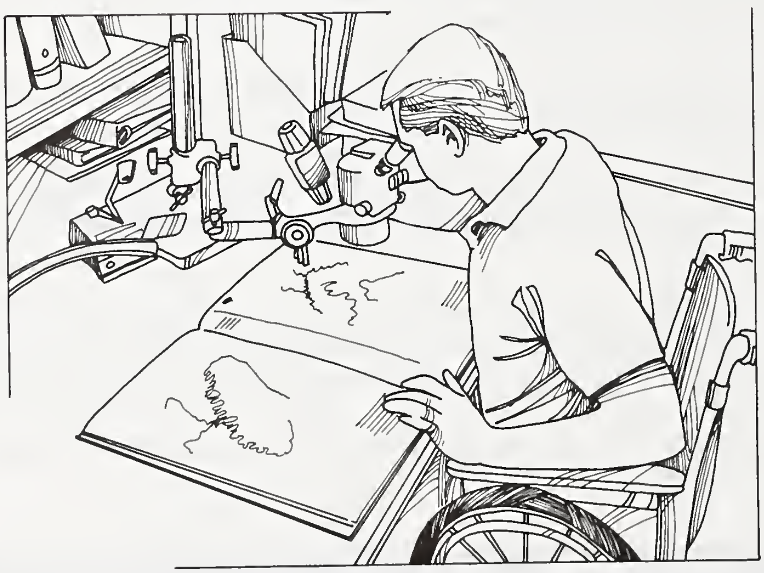
Table B-16 displays the ASQ for each alternative with and without the departure for the first period and the projected ASQ for the second period.

Table B-16. ASQ by alternative for the first period with and without departure for the first period and the ASQ for the second period in million cubic feet.

	Alternative				
	A	B	C	D	C
1st Period ASQ without departure	0	11.9	11.9	7.8	7.5
1st Period ASQ with departure	0	30.7	32.7	28.3	30.2
2nd Period ASQ	0	28.8	22.0	19.9	21.0

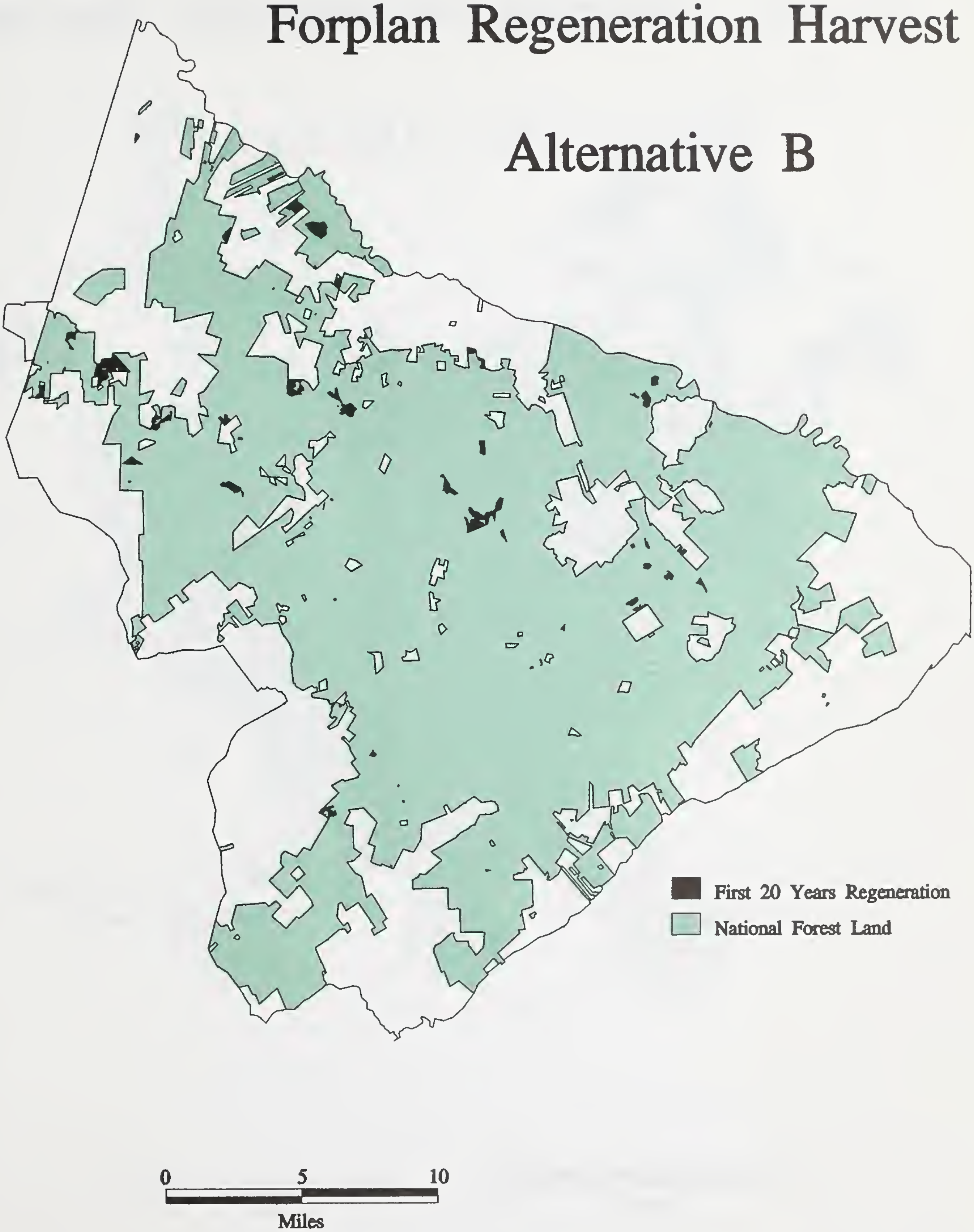
Spatial Analysis

The following maps show the regeneration harvests scheduled for the first and second periods and are used to analyze the spatial distribution of the modeled harvest areas. This was done to verify the viability of the alternative harvest schedule in relation to spatial constraints and minimum management requirements.



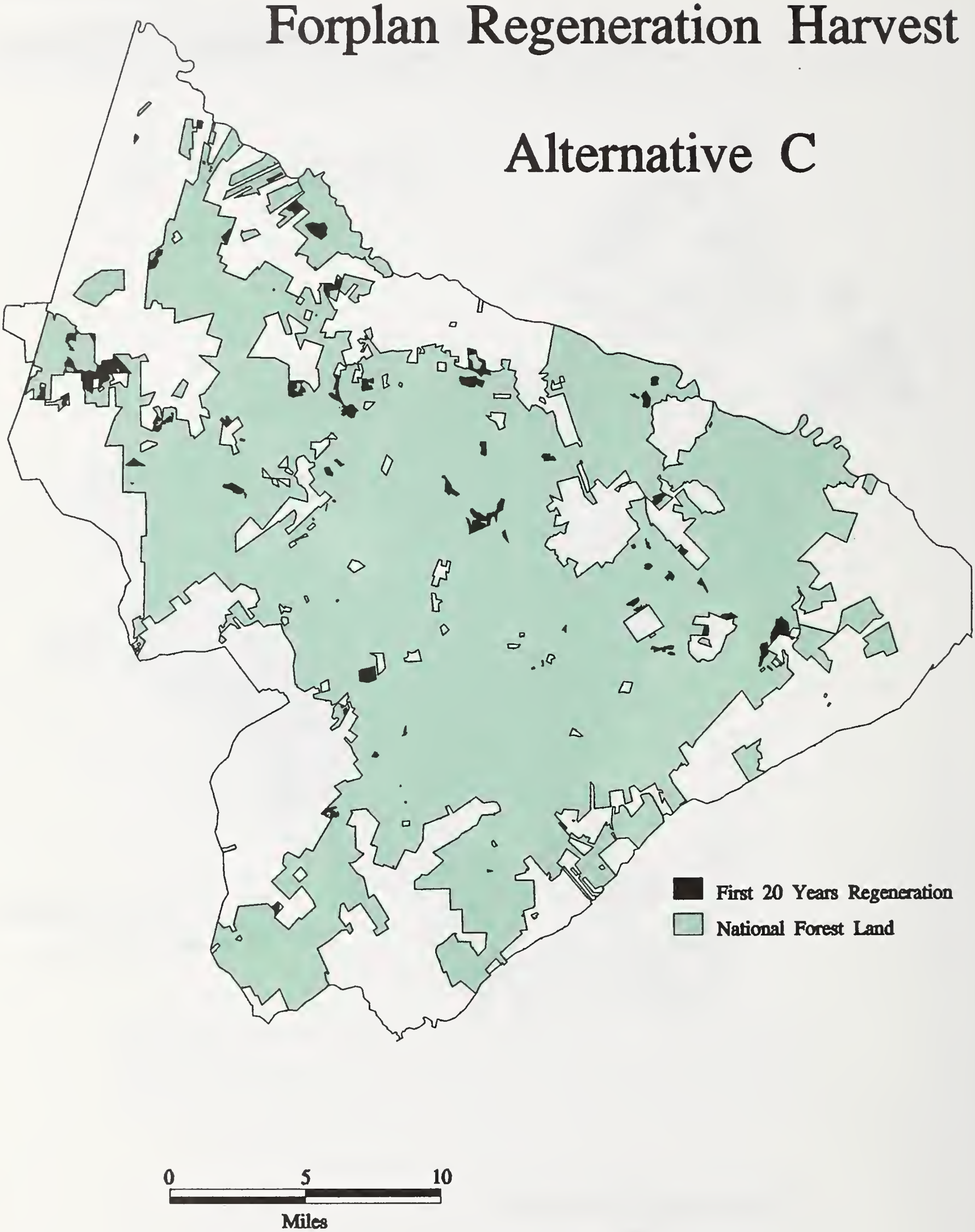
Forplan Regeneration Harvest

Alternative B



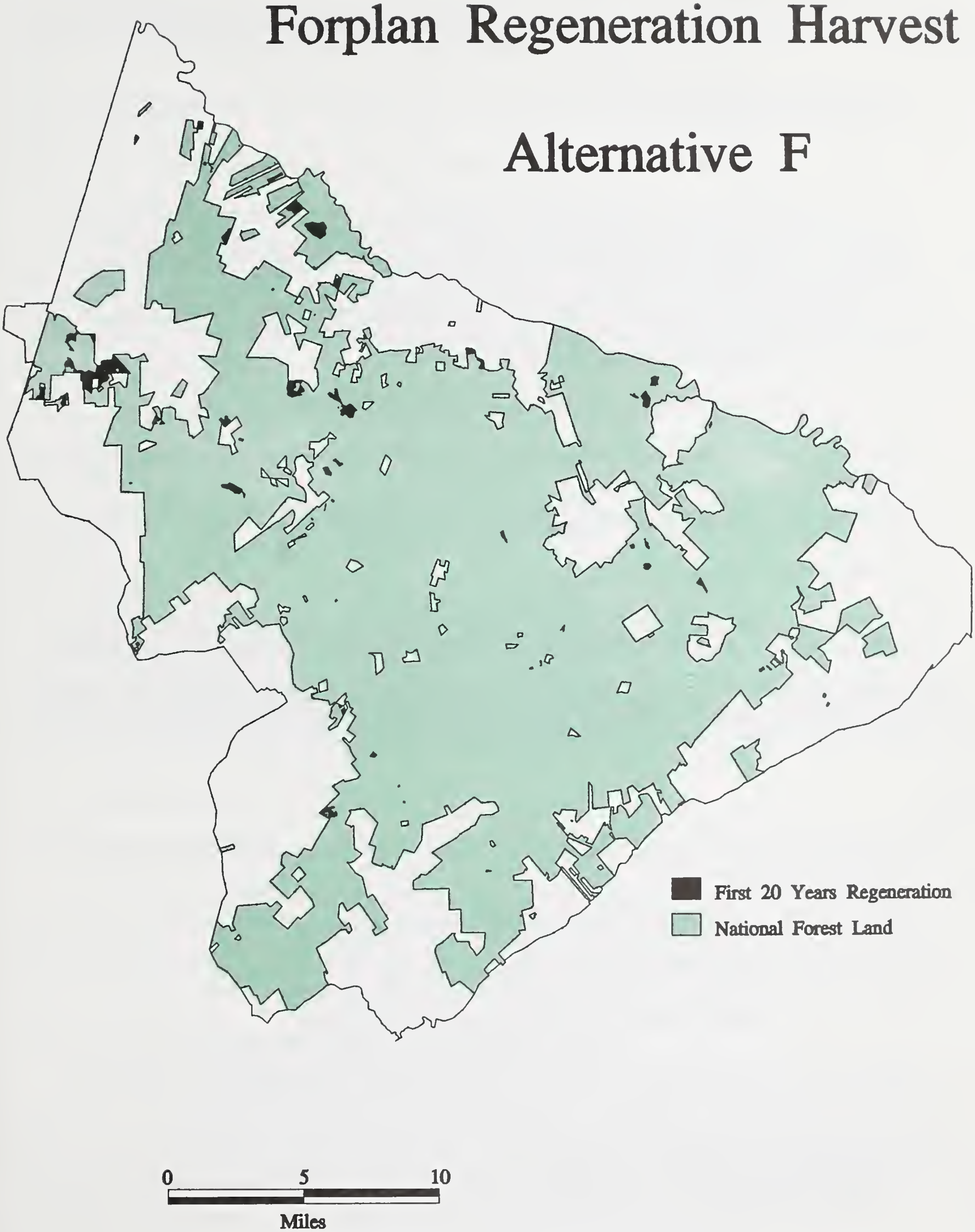
Forplan Regeneration Harvest

Alternative C



Forplan Regeneration Harvest

Alternative F



Management Indicator Species (MIS)

The Planning Regulations (USDA, Forest Service, 1980) which implement the National Forest Management Act of 1976 (90 Stat. 2949 et seq.) explicitly set forth several wildlife–related goals. Chief among these are the charges that:

1. Habitats are to be managed to maintain viable populations of all existing native and desired non-native vertebrates in the planning area.

2. The Forest Plan establishes objectives for maintaining and improving habitat for selected species.

3. Management shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area.

In order to estimate the effects the Forest Plan has on fish and wildlife populations, the regulations require that certain species present in the planning area be identified and selected as management indicator species. In selecting MIS, the regulations require consideration of species in the following categories:

1. Endangered and threatened plant and animal species identified on State and Federal lists;

2. Species with special habitat needs that may be influenced significantly by planned management programs (sensitive species);

3. Species commonly hunted, fished, or trapped (species of economic importance);

4. Non-game species of special interest;

5. Other plant or animal species whose population charges are believed to indicate effects of management activities on other species of a major biological community or water quality (ecological indicator species).

The MIS were chosen as representatives of the total list of species inhabiting the planning area; and forest planning will focus on these species to maintain viable populations of all existing native vertebrates and plant species. This section documents the process which was used to select these species.

Method

The process employed in the development of MIS for the 1985 Forest Plan is still valid for the Forest Plan revision. The initial project was a six step process:

1. Determine native species found on the Forest that depend on forest habitat.

2. Select species which address issues and concerns.

3. Select plant and animal species of endangered, threatened and sensitive status.

4. Identify broad classes of habitats and select ecological indicator species for those habitats not already represented.

5. Further reduce the MIS list by applying criteria such as
    a) permanence of residency,
    b) availability of literature and information, and
    c) monitoring capability.

6 The final step was a review by peers, cooperative agencies and Regional experts.

For a more detailed description of the methodology used in the original selection of MIS see "Process Record for Selection of Management Indicator Species and Their Management Needs — Francis Marion National Forest" (Stewart, 1985).

Terrestrial Species

Early Successional Species

Conifer/Grass Forb

The white-tailed deer was selected as an important and highly–demanded game animal which browses on early successional plants. The yellow-breasted chat represents those species needing shrubs and thickets. The eastern bluebird represents the perching-hawking species which require snags for perching and nesting. The northern bobwhite quail represents ground nesting species which require early successional grasses and forbs for nesting and feeding.

Upland Hardwood/Grass Forb

Same species chosen as for the conifer/grass forb.

Bottomland Hardwood/Grass Forb

The species chosen to represent this type of habitat were the white-tailed deer, white-eyed vireo and the eastern king snake.

Mixed/Grass Forb

No species were restricted to this mixed type; therefore, none were selected. However, the high density of species found in mixed types indicates the need for a mixture of pine and hardwood. Many species occur at their highest population in mixed forest types, e.g., sharp-shinned hawk, Cooper's hawk, and eastern fox squirrel. Actually seldom does a pure timber type occur within the Forest, e.g., numerous hardwoods can be found in stands classified as pine stands and many pine normally are found in hardwood stands. Mixtures in stand may not be necessary for viable populations, but mixed stands are desirable.

Late Successional Species:

Conifer–Sawtimber/Over-mature

The red-cockaded woodpecker was selected since it is an endangered species and because of its cavity requirements and its need for open understories in mature pine stands. The eastern fox squirrel was selected for its rareness and its importance as a game species. This species is only present if an admixture of hard-mast producers are present in this type. The eastern wild turkey was selected to represent the ground nesting species and the need for open understories. The pine warbler was chosen to represent the canopy dwellers and foliage gleaning species.

Upland Hardwoods and Bottomland Hardwoods - Sawtimber/Over-mature

These two forest type vertebrate associates were combined and the appropriate species were selected. The pileated woodpecker was selected due to its specific habitat requirements. It is a primary cavity excavator and prefers snags 22+ inches DBH. Its primary source of food is extracted from decaying trees. Eastern wild turkey and eastern grey squirrel were selected because of their importance as game species. Both require mature and over-mature mast–producing trees. The eastern wild turkey is also intolerant of excessive human disturbance. The red-eyed vireo was selected to represent the canopy dwellers and the foliage gleaners found in this type.

Mixed–Sawtimber/Over-mature

No species were restricted to this type and none were selected.

Aquatic Species

The largemouth bass was selected due to its importance as a game species and to represent the top feeding carnivores. The redbreast sunfish was selected because of its need for sandy substrates and its importance as a game species. The speckled madtom was selected to represent those fish species that feed on the bottom, as well as those that use sand or gravel substrates.

Riparian Associated Species

Wildlife use riparian zones disproportionately more than any other type of wildlife habitat (Kelly et al. 1975). More than one-half of the terrestrial species of the planning area occur regularly in riparian habitats. Since most of the riparian areas on the Forest bisect bottomland hardwood, the same species selected to constrain management for the bottomland hardwood -sawtimber/over-mature type were chosen to represent the riparian areas. The southern dusky salamander was added to represent those species which require damp, cool and shady habitats. The brown water snake was also added to represent the species requiring areas for sunning and resting in and adjacent to stream environment.

Revision

For the purpose of the Forest Land Management Plan Revision, the initial list and methodology used is still appropriate and accepted as the Forest Plan MIS with a few additions. Based on new concerns and issues relating to wetland management, the prothonotary warbler (*Protonotaria citrea*) has been added to the MIS list. The prothonotary warbler is found almost always near standing water. They prefer swamps that are somewhat open with scattered dead stumps, bottomland forests; and extensive willow thickets near lakes or ponds. They generally forage within 15 feet of the ground or water surface, gleaning insects and other small invertebrates from leaves, twigs, stubs, and other places in swamp or bottomland. The prothonotary warbler also represents cavity nesters.

The raccoon was considered as a MIS for wetland habitat; however, due to the cyclic nature of its population, we believe it was not a good indicator of the effects of management activities. The wood duck was also considered as an indicator, but it is a very adaptable species and may not be the best indicator of management. Many of its habitat needs such as wetland attributes and cavity needs are similar to the prothonotary warbler. Other MIS also represent wetlands such as the southern dusky salamander, the brown water snake, and some T and E plant species such as *Lindera melissaefolium.*

Based on comments from the Regional Office, the Supervisor's Office and the Districts and an evaluation of previous monitoring, the pine warbler *(Dendroica pinus)* was deleted from the MIS list. Its status is common and widespread throughout the Coastal Plain. Its habitat is associated with pine woods in a variety of situations. Because of its abundance and ability to use a variety of pine habitat, it is not a good indicator of the effects of management activities. The wood thrush *(Hylocichla mustelina)* was added to the MIS list to represent bush nesters and species which glean insects on the forest floor. It favors deciduous or mixed forest with a fairly well–developed understory, especially where moist. Bottomland and other rich forests are prime habitats; they are also frequent in pine forests with a deciduous understory. The great crested flycatcher *(Myiarchus crinitus)* was added to the MIS list to represent cavity nesters with different habitat needs from the eastern bluebird. This species generally prefers somewhat open forests with a suitable cavity for nesting. It is found in hardwoods, mixed woods and pine stands. Bachman's sparrow *(Aimophila aestivalis)*, a sensitive species, was also included on the management indicator list to represent those species which prefer grass-forb pine and mixed stands with herbaceous cover generally less than a foot.

The management indicator list includes six bird species which are neotropical migrants. Prothonotary warbler, red-eyed vireo, wood thrush and great crested flycatcher represent neotropical migrants which prefer primarily forested interior habitat. The yellow-breasted chat and the white-eyed vireo are also neotropical migrants; however, they prefer habitat associated with early successional or edge habitat.

Since our PETS plant species have been monitored closely for several years, many of those species known to occur on the Forest have been added to the list of management indicator species. These plant species represent special habitat, and population changes indicate the effects of management activities. Not all PETS plant species were included because several species had similar habitats. Plant species and unique communities were chosen after consultation with the

Forest Ecologist, Robin Roecker. The species were chosen to represent all plant species with similar habitat needs.

The plant species added to the MIS list include pondberry *(Lindera melissaefolium)*, climbing heath *(Pieris phyllreifolia)*, American chaffseed *(Schwalbea americana)* and Wagner's spleenwort *(Asplenium heteroresiliens)*. Some communities were also added to the list to indicate the effects on unique communities, and they include Carolina bays, pond cypress ponds, and longleaf pine savannahs. Many of the plant species listed are found in association with these communities and are characteristic of a healthy community. These communities will be monitored in conjunction with their associated plant and animal species. There are no known populations of Canby's dropwort on the Forest. Pondspice has similar habitat as pondberry; both incised groovebur and Chapman's sedge have similar habitat as chaffseed. Therefore, they were not included on the list. Loose watermilfoil was also considered, but its habitat is not likely to be affected by management activities.

MANAGEMENT INDICATOR SPECIES

SPECIES	HABITAT
AQUATIC HABITAT:	
Largemouth Bass *(Micropterus salmoides)* (game species)	Top feeding carnivore Lake, pond, & streams
Redbreast Sunfish *(Lepomis auritus)* (game species)	Sandy substrate Streams needed
Speckled Madtom *(Noturus leptacanthus)*	Bottom feeder; sand or gravel substrate Streams needed
RIPARIAN HABITAT:	
Southern Dusky Salamander *(Desmognathus fuscus conanti)*	Bottomland hardwood/Mature Damp, Cool & Shady
Brown Water Snake *(Natrix taxispilota)*	Bottomland hardwood Adjacent to streams with areas for sunning
Prothonotary Warbler *(Protonotaria citrea)*	Swamps & bottomland forests; fairly open, near standing water; cavity nester
ASSOCIATED WITH LIMESTONE BLUFFS AND LIMESTONE SINKHOLES	
Pondberry *(Lindera melissaefolium)*	Margins of sinkholes and shallow depression in longleaf pine forests
Wagner's Spleenwort *(Asplenium heteroresiliens)*	Shaded limestone outcrops
LONGLEAF PINE ECOSYSTEM (DRIER SITES)*	
American Chaffseed *(Schwalbea americana)*	Pine savannahs and flatwoods, fire maintained
Climbing Heath *(Pieris phillyreifolia)*	Pond cypress ponds and pond cypress savannahs

SPECIES	HABITAT
GRASS-FORB ASSOCIATED HABITAT:	
White-tailed Deer *(Odocoileus virginianus)* (game species)	Conifer/grass forb, upland hardwood, bottomland hardwood
Northern Bobwhite Quail *(Colinus virginianus)* (game species)	Conifer/grass forb/sawtimber Upland hardwood; ground nesting
Yellow-breasted Chat *(Icteria virens)*	Conifer/grass forb/upland hardwood Shrubs & thickets; bush nesting
Bachman's Sparrow *(Aimophila aestivalis)*	Open pinewoods with a thick cover of grasses or saw palmetto; ground nesting
Eastern Bluebird *(Sialia sialis)*	Conifer/grass forb; upland hardwood Secondary cavity nester
Eastern Kingsnake *(Lampropeltis getulus getulus)*	Bottomland hardwood; upland hardwood, conifer
White-eyed Vireo *(Vireo griseus)*	Bottomland hardwood; bush nesting, foliage gleaner
SAWTIMBER/OVER-MATURE ASSOCIATED HABITAT:	
Red-cockaded Woodpecker *(Picoides borealis)* (endangered species)	Conifer; primary excavator–live pines
Eastern Fox Squirrel *(Sciurus niger)* (game species)	Conifer/mature; hardwood/mature
Eastern Wild Turkey *(Meleagris gallopavo)* (game species)	Conifer; upland hardwood; bottomland hardwood; ground nester
Wood Thrush *(Hylocichla mustelina)*	Deciduous or mixed with deciduous understory moist sites; bush nesting,
Great Crested Flycatcher *(Myiarchus crinitus)*	Open forest with suitable cavity: hardwood, mixed or pine , cavity nester
Pileated Woodpecker *(Dryocopus pileatus)*	Upland hardwood; bottomland hardwood; primary excavator
Eastern Gray Squirrel *(Sciurus carolinensis)*	Upland hardwood; bottomland hardwood (All woodland habitat)

SPECIES	HABITAT
(game species)	
Red-Eyed Vireo *(Vireo olivaceus)*	Upland hardwood; bottomland hardwood; canopy dweller; foliage gleaner

UNIQUE COMMUNITIES:

Carolina Bays
Pond Cypress Ponds
Longleaf Pine Savannahs

*Note: Other indicator species are also characteristic of the longleaf pine ecosystem. They include northern bobwhite quail, red-cockaded woodpecker and eastern fox squirrel.

Master List of Activities and Definitions

The following definitions were used in evaluating the effects of probable activities in Chapter III.

1. Constructing developed recreational facilities includes designing and constructing facilities such as boat ramps, canoe accesses, horse camps and campgrounds.

2. Maintaining developed recreational facilities includes mowing grass, applying herbicides, removing hazard limbs/trees, general painting, replacing signs/bulletin boards, cleaning of toilet facilities and removing litter.

3. Constructing trails includes removing trees and brush, stabilizing surfaces, constructing trail bridges, installing erosion controls, blazing trees, and erecting signs.

4. Maintaining trails includes clearing brush, cutting tree limbs, mowing tread stabilization, re-blazing trees, replacing signs and removing litter.

5. Charging user fees includes administering and collecting fees for certain non-commodity uses such as camping, parking, picnicking, etc.

6. Closing roads consists of permanently or periodically closing Forest Service roads to motorized vehicle traffic. Methods may include obliterating the road or blocking traffic by barricades or gates.

7. Constructing roads consists of clearing a right-of-way for motorized vehicle traffic where no travelway previously existed and/or grading, ditching, installing culverts, installing bridges and surfacing the right-of-way.

8. Reconstructing roads consists of improving an existing motorized vehicle travelway by any combination of widening the right-of-way, grading, ditching and surfacing.

9. Maintaining roads consists of grading, adding surface material, controlling right-of-way vegetation (mowing, applying herbicide), placing and maintaining signs, cleaning out ditches and culverts and repairing bridges on existing motorized vehicle travelways.

10. Cross–country motorized vehicle travel involves off–trail and off–road travel by motorcycles, all-terrain vehicles and other 4-wheel drive vehicles capable of cross-country travel.

11. Constructing wildlife openings includes initial removing or altering existing vegetation, disking, applying lime and fertilizer, and planting species such as grasses, legumes, shrubs and mast–producing trees beneficial to wildlife. Forested areas, closed roads or rights-of-way may serve as wildlife openings.

12. Maintaining wildlife openings includes disking, fertilizing, liming, applying herbicides and seeding with plant species beneficial to wildlife in existing wildlife openings.

13. Converting pine stands to mixed stands includes harvesting pine stands and regenerating the stand to 30-70 percent hardwood. Methods may include planting pine at lower densities and/or varying the intensity of site preparation.

14. Converting loblolly pine to longleaf pine consists of replacing the loblolly pine forest type with the longleaf forest type. The methods may include harvesting existing loblolly pine trees and planting longleaf pine trees; burning loblolly seedlings which have invaded longleaf sites and planting longleaf pine; gradually converting areas containing a mixture of loblolly and longleaf pine by harvesting loblolly pine and burning under the stand to favor longleaf regeneration.

15. Harvesting trees involves cutting and removing (skidding, loading, and hauling) the commercial wood product portion of trees.

16. Establishing regeneration means establishing a desired mix of tree species. Methods can be artificial or natural. Artificial methods include site preparation and planting seedlings or seeds. Natural methods include sprouting from stumps or site preparation for natural seed fall. Site preparation includes using fire, herbicides, mechanical equipment or manual equipment.

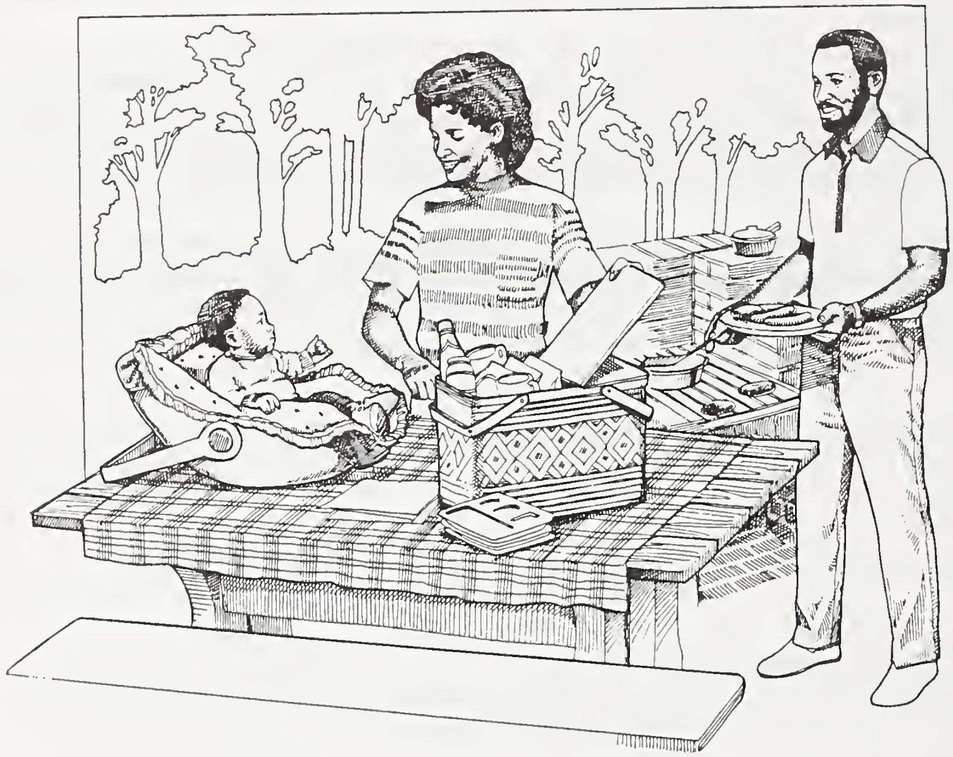
17. Prescribed burning is the planned burning of ground level vegetation or debris under desired conditions. This includes igniting (aerial or ground), containing (use of natural or constructed barriers, water, personnel and equipment) and extinguishing (allowing to burn out or put out) the fire.

18. Applying herbicides involves killing or stunting the growth of unwanted vegetation using herbicides by manual or mechanical ground applications. Applications may be done by individual stem, in spots, in strips, or by broadcasting.

19. Timber stand improvement involves activities to achieve desirable densities, growth rates, or species composition of forested stands. May use mechanical or manual methods to pre-commercial thin or release desirable species from competing vegetation.

20. Managing hardwood in pine stands refers to the hardwood component found with pine stands. A pine stand can have as much as 30 percent hardwood and still be called a pine stand. The primary method of management is prescribed fire or excluding fire. Management also includes adjusting site preparation to allow for more hardwood and release of desirable hardwoods (i.e., mast producers) in timber stand improvement activities.

21. Managing transitions and inclusions—transition areas include the area joining pine stands to hardwood stands. These areas often include a transition from better drained sites to wetter areas. Inclusions refer to clumps of hardwoods too small to be considered a separate stand (< 10 acres) found within a pine stand. Management includes using or excluding fire.



Appendix C
Roadless Area Review

Criteria for Roadless Area Inventory

The following criteria are from the Land and Resource Management Planning Handbook (FSH 1909.12, Chapter 7.11). Roadless areas qualify for placement on the inventory of potential wilderness if, in addition to meeting the statutory definition of wilderness, they meet one or more of the following criteria:

1. They contain 5,000 acres or more.

2. They contain less than 5,000 acres but:

   a. Due to physiography or vegetation, they are manageable in their natural condition.
   b. They are self-contained ecosystems such as an island.
   c. They are contiguous to existing wilderness, primitive areas, administration endorsed wilderness, or roadless areas in other Federal ownership, regardless of their size.

3. They do not contain improved roads maintained for travel by standard passenger-type vehicles, except as permitted in areas east of the 100th meridian. (sec. 7.11b)

Criteria for eastern roadless areas are as follows (sec 7.11b):

1. The land is retaining a natural, untrammeled appearance.

2. Improvements existing in the area are being affected by the forces of nature rather than humans and are disappearing or muted.

3. The area has existing or attainable National Forest System ownership patterns, both surface and subsurface, that could ensure perpetuation of identified wilderness values.

4. The location of the area is conducive to the perpetuation of wilderness values. Consider the relationship of the area to sources of noise, air, and water pollution, as well as unsightly conditions that would have an effect on the wilderness experience. The amount and pattern of Federal ownership is also an influencing factor.

5. The area contains no more than a half mile of improved road for each 1,000 acres and the road is under Forest Service jurisdiction.

6. No more than 15 percent of the area is in non-native, planted vegetation.

7. Twenty percent or less of the area has been harvested within the past 10 years.

8. The area contains only a few dwellings on private lands and the location of these dwellings and their access needs insulate their effects on the natural conditions of Federal lands.

Analysis of Roadless Areas on the Forest

Preliminary analysis of roadless characteristics using the above criteria was conducted in a GIS environment. GIS information included location of endangered species, cultural resources, roads, vegetation, soil types and recent harvesting activities. An evaluation of road density was done using GIS.

No areas outside existing wilderness met the size criteria, located at least 1/2 mile from roads and not more than 1/2 mile of road per 1,000 acres.

The only areas with a potential to be classified as roadless areas are adjacent to existing wilderness. All areas adjacent to existing wilderness were evaluated and two were found to have roadless area potential.

HELLHOLE BAY EXTENSION
Roadless Area Review and Evaluation
Witherbee Ranger District
Francis Marion National Forest
Berkeley County, South Carolina

1. Description of Area

A. Roadless area name and number of acres Hellhole Bay Extension; Approximately 890 acres.

B. Location and vicinity

The Hellhole Bay Extension is located on the Witherbee Ranger District, Francis Marion National Forest located in Berkeley County, approximately 32 miles north of Charleston, SC. The area lies immediately south of the existing Hellhole Wilderness.

C. Access to the area including roads and trails leading to the area

Wet terrain, insects and dense vegetation discourages recreation use of the area. There are no roads or trails within the area. Access to the area is from Forest Road 1613 on the west and Forest Road 162 on the east. Both roads come within one-quarter mile of the boundary.

D. General description of the area's geography

The vegetation in the area is typical of a coastal plain depression.
The land form serves as a collection basin for the surrounding pine upland. Flood waters are not stagnant but move gradually toward creek drainages.

E. General description of the area's topography

The area is typical coastal plain bay with no visible relief. During wet weather, virtually the whole area is flooded.

F. General description of the area's vegetation

Tree species in the area are a mixture of swamp and water tupelo, and baldcypress with an understory of red maple, sweetbay and southern bayberry.

G. Key attractions, if any, including sensitive wildlife and scenic landmarks

There are no key attractions or scenic landmarks in the area. This bay is typical to many others found on the forest. There are no inventoried threatened or endangered species within the boundary. Although red-cockaded woodpecker clusters are located in the vicinity, the area does not offer suitable RCW habitat.

II. Area Inventory

A. Human Influence

The bay has a history of logging but there has not been any recent activity. All recent logging activity and regeneration areas were excluded from the area to be considered as roadless.

B. Improvements, Structures, and Non-conforming Uses

1. Airstrips or heliports—There are no airstrips or heliports in the area.

2. Electronic installations–None.

3. Evidence of mineral activity - None.

4. Mineral leases—There are no outstanding mineral rights and no mineral leases issued or pending.

5. Recreation improvements—None.

6. Timber harvest areas where logging and prior road construction are evident - There is little evidence of past logging with the exception of occasional old stumps.

7. Cultural treatments involving plantations or plantings - None.

8. Private in-holdings—None.

9. Utility lines—None.

10. Dwellings—None.

11. Watershed treatments - None.

12. Roads—None.

13. ORV Use—None.

C. Mitigation of non-conforming uses

Due to the swamp-like conditions, there are no non-conforming uses that need to be mitigated. Public use of the area is virtually non-existent.

D. Timber harvest

None of the area has been harvested in the past ten years. Almost all of the area has been logged but none in recent history. All past regeneration was by natural means.

E. Roads

There are no roads within the area. The size of the area has significantly been reduced so as to exclude any roads. Had the area been extended to the reasonable road boundaries, the road density would have exceeded the amount allowed (1/2 mile per 1000 acres).

III. Evaluation of Potential Wilderness

A. Capability

1. Solitude and serenity—Opportunities exists but evidence and sounds of civilization remain. The greatest distance from a road within the area is approximately 4,000 feet.

2. Challenge—Access to the area is not easy. The land between the road and the area is relatively easy to traverse if it has been recently prescribed burned. However, traversing the area itself is very difficult due to heavy undergrowth and water most of the year.

3. Outdoor Recreation Opportunities—The area has little opportunity for recreational activities. Because of the thick undergrowth, wet conditions and insects most visitors to the forest avoid such areas.

4. Special Features—There are no special or unique features found in this area that are not found in numerous other bays on the forest.

5. Manageability—Much of the boundary is not readily apparent and must be surveyed and marked on the ground. The boundary will be costly to establish and maintain.

B. Availability

Nonwilderness resource demands and uses–The area contains primarily low quality hardwood that has been further damaged by Hurricane Hugo. During the past ten years, this type of timber has provided very little to the timber production on the forest. Costs of logging and road building usually exceeds the value of this type timber. Timber activity in the future are not expected to increase unless there is a drastic increase in timber prices.

There are no existing recreation areas, trails or other recreational improvements in the area. The area is poorly suited for all types of recreation including hunting but does provide wildlife habitat for numerous species.

There are no other uses or contractual agreements that would be conflicting if this area were placed in wilderness status.

C. Need

There are four wilderness areas on the Francis Marion National Forest. These areas receive little recreation use because of the dense swamp undergrowth and frequent standing water. The Hellhole Bay Extension is similar in nature to the wilderness areas. In the foreseeable future, the area will be managed similarly to wilderness areas. This is because there is little potential for any type of development and the timber has been heavily damaged by Hurricane Hugo.

Little Wambaw Swamp Extension
Roadless Area Review and Evaluation
Wambaw Ranger District
Francis Marion National Forest.
Charleston County, South Carolina

1. Description of Area

A. Roadless area name and number of acres

Little Wambaw Swamp Extension; Approximately 530 acres.

B. Location and vicinity

The Little Wambaw Bay Extension is located on the Wambaw Ranger District, Francis Marion National Forest in Charleston County, approximately 28 miles north of Charleston, SC. The area lies immediately northwest of the existing Little Wambaw Swamp Wilderness.

C. Access to the area including roads and trails leading to the area

Wet terrain, insects and dense vegetation discourages recreation use of the area. This area contains no roads or trails. Access to the area is by Forest Road 217 on the west which is the primary access to the area. Forest Roads 220 and 217-A parallel the area on north and south respectively. Each road is approximately one-quarter to one-half mile from the area. A parcel of private land is located on the northern boundary.

D. General description of the area's geography

The vegetation in the area is typical of a coastal plain swamp. The area serves as a connection between two larger swamps that compose the Wambaw Swamp and Little Wambaw Swamp Wildernesses. Flood waters are not stagnant but move gradually through the drainage.

E. General description of the area's topography

The area is typical coastal plain swamp with no visible relief.
During wet weather, most of the area is flooded.

F. General description of the area's vegetation

Vegetation in the area are a mixture of swamp and water tupelo, baldcypress with an understory of red maple, sweetbay and southern bayberry.

G. Key attractions, if any, including sensitive wildlife and scenic landmarks. There are no key attractions or scenic landmarks in the area. This bay is typical to many others found on the forest. There are no inventoried threatened or endangered species within the boundary. Although red-cockaded woodpecker clusters are located in the vicinity, the area does not offer suitable RCW habitat.

II. Area Inventory

A. Human Influence

There is little evidence of logging except for occasional stumps.
The timber was heavily impacted by Hurricane Hugo and most of the larger trees were destroyed. No salvage operations were conducted in the swamp.

B. Improvements, Structures, and Non-conforming Uses

1. Airstrips or heliports—There are no airstrips or heliports in the area.

2. Electronic installations—None.

3. Evidence of mineral activity—None.

4. Mineral leases—There are no outstanding mineral rights and no mineral leases issued or pending.

5. Recreation improvements—None.

6. Timber harvest areas where logging and prior road construction are evident—There is little evidence of past logging with the exception of occasional old stumps.

7. Cultural treatments involving plantations or plantings—None.

8. Private in-holdings—None.

9. Utility lines—None.

10. Dwellings—None.

11. Watershed treatments—None.

12. Roads—None.

13. ORV Use—None.

C. Mitigation of non-conforming uses

Due to the swamp-like conditions, there are no non-conforming uses that need to be mitigated. Public use of the area is virtually non-existent.

D. Timber harvest

None of the area has been harvested in the past ten years. Almost all of the area has been logged but none in recent history. All past regeneration was by natural means.

E. Roads

There are no roads within the area. The size of the area has significantly been reduced so as to exclude any roads. Had the area been extended to the reasonable road boundaries, the road density would have exceeded the amount allowed (1/2 mile per 1000 acres).

III. Evaluation of Potential Wilderness

A. Capability

1. Solitude and serenity—Opportunities exists but evidence and sounds of civilization remain. The greatest distance from a road within the area is approximately 2,000 feet. Private land is also located along the northern boundary.

2. Challenge—Access to the area is not easy. The land between the road and the area is relatively easy to traverse if it has been recently prescribed burned. However, traversing the area itself is very difficult due to heavy undergrowth and water most of the year.

3. Outdoor Recreation Opportunities—The area has little opportunity for recreational activities except for hunting and bird watching. Because of the thick undergrowth, wet conditions and insects, most visitors to the forest avoid such areas.

4. Special Features—There are no special or unique features found in this area that are not found in numerous other bays on the forest.

5. Manageability—Much of the boundary is not readily apparent and must be surveyed and marked on the ground. The boundary will be costly to establish and maintain.

B. Availability

Nonwilderness resource demands and uses—The area contains primarily low quality hardwood timber as a result of Hurricane Hugo. During the past ten years, this type of timber has provided very little to the timber production on the forest. Costs of logging usually exceeds the value of this type timber. Market demand for this type of timber is not expected to increase in the foreseeable future unless there is a drastic increase in timber prices.

There are no existing recreation areas, trails or other recreational improvements in the area. The area is poorly suited for most types of recreation except hunting and bird watching.

There are no other uses or contractual agreements that would be conflicting if this area were placed in wilderness status.

C. Need

There are four wilderness areas on the Francis Marion National Forest. With the exception of Wambaw Creek, these areas receive little recreation use because of the dense swamp undergrowth and frequent standing water. The Little Wambaw Swamp Extension is similar in nature to the wilderness areas. In the foreseeable future, the area will be managed similarly as wilderness areas. This is because there is little potential for any type of development.

Areas Proposed by the Public for Roadless

A proposal was received from the South Carolina Coastal Conservation League for a roadless area connecting the wilderness areas on the Forest. The proposal was reviewed and the area did not meet the requirements for roadless attributes described earlier. Areas similar to the group's proposal are included in management area 23 in alternative D and management area 29 in alternative F. These management areas emphasize low human disturbance and road closure where possible and providing wildlife habitat linkages.


CARLSON

Appendix D
Proposed, Endangered, Threatened and Sensitive Species

Species	Forest Service Status	Federal Status
Group: Mammals		
Black Bear *Ursus americanus*	S	—
Rafinesque's Big-Eared Bat *Plecotus rafinesquii*	S	C2
Eastern Wood Rat *Neotoma floridana magister*	S	C2
Group: Birds		
Red-Cockaded Woodpecker *Picoides borealis*	E	E
Bachman's Warbler *Vermivora bachmanii*	E	E
Bald Eagle *Haliaeetus leucocephalus*	E	E
Wood Stork *Mycteria americana*	E	E
Bachman's Sparrow *Aimophila aestivalis*	S	C2
Loggerhead Shrike *Lanius ludovicianus migrans*	S	C2
Henslow's Sparrow *Ammodramus henslowii*	S	C2
American Swallow-Tailed Kite *Elanoides forficatus forficatus*	S	C3

Species	Forest Service Status	Federal Status
Group: Amphibians		
Flatwoods Salamander *Ambystoma cingulatum*	S	C2
Carolina Gopher Frog *Rana areolata capito*	S	C2
Eastern Tiger Salamander *Ambystoma tigrinum tigrinum*	S	--
Group: Reptiles		
American Alligator *Alligator mississippiensis*	T(S/A)	T(S/A)
Northern Pine Snake *Pituophis melanoleucus melanoleucus*	S	C2
Group: Plants		
Pondberry *Lindera melissifolia*	E	E
Canby's Dropwort *Oxypolis canbyi*	E	E
American Chaffseed *Schwalbea americana*	E	E
Incised Groovebur *Agrimonia incisa*	S	C2
Carolina Spleenwort (Wagner's Spleenwort) *Asplenium heteroresiliens*	S	C2
Pondspice *Litsea aestivalis*	S	C2
Awned Meadowbeauty *Rhexia aristosa*	S	C2

Species	Forest Service Status	Federal Status
Group: Plants continued		
Climbing Heath *Pieris phillyreifolia*	S	—
Savannah Milkweed *Asclepias pedicellata*	S	--
Black-stem Spleenwort *Asplenium resiliens*	S	--
Leather-leaf *Chamaedaphne calyculata*	S	--
SE Sneezeweed *Helenium pinnatifidum*	S	--
Spoon-flower *Peltandra Sagittifolia*	S	--
Yellow Fringeless Orchid *Platenthera integra*	S	--
Crested Fringed Orchid *Pteroglossapsis ecristata*	S	--
Tny-lvd Buckthorn *Sageretia minutiflora*	S	--
Lace-lipped Ladies' Tresses *Spiranthes laciniata*	S	--
Nodding Pogonia *Triphora trianthophora*	S	--
Coreopsis gladiata	S	--

S = Sensitive species. Those plant and animal species identified by a Regional Forester for which population viability is a concern.

E = Endangered species. Any species in danger of extinction throughout all or a significant portion of its range.

C2 = Category 2 Candidate species. Those plant and animal species for which information now in possession of the FWS indicates that proposing to list the species as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules.

C3 = Category # Candidate species. Those plant and animal species which are no longer being considered for listing as endangered or threatened and are not regarded as candidate species.

T(S/A) = Threatened due to similarity of appearance to a federally threatened species.

Appendix E
Eligibility and Suitability of Rivers for Potential Wild and Scenic Classification

Eligibility Criteria

Eligibility, as specified in Sections 1(b) and 2(b) of the Wild and Scenic Rivers Act, is the qualification of a river for inclusion in the national system through determination that it is free flowing and, with its adjacent land area, has at least one outstandingly remarkable value. The determination of whether a river contains outstandingly remarkable values is a professional judgement on the part of the ID team. A determination that a particular river is eligible for designation does not necessarily imply that it is suitable for designation in terms of national interest.

Length

There are no specific requirements concerning the length of an eligible river segment. A river segment is of sufficient length if, when managed as a wild, scenic, or recreational river area, the outstandingly remarkable values are protected.

Flow

Flow is the volume of water in a river passing a given point in a given period of time. There are no specific requirements concerning the flow of an eligible river segment. Flows are sufficient if they sustain or compliment the outstandingly remarkable values for which the river would be designated. This would also apply to rivers with some impoundments or water diversions.

Outstandingly Remarkable Values

Values may be scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. Outstandingly remarkable indicates that values are a conspicuous example of a value among similar values that is uncommon. All streams have some value, but when compared to each other, some streams values will be more outstanding.

Classification Criteria

Section 2(b) of the Wild and Scenic Rivers Act states that rivers which are found eligible shall be classified as wild, scenic or recreational. The following criteria for determining classification is from the revised guidelines for Wild and Scenic Rivers developed jointly by the Departments of the Interior and Agriculture (*Federal Register*, Vol. 47, No 173, Sept. 7,1982)

Wild River

The river should be free of impoundments.

The shoreline should be essentially primitive with little or no evidence of human activity; however, the presence of a few inconspicuous structures is acceptable. There should be little or no evidence of past timber harvest and no ongoing timber harvest.

The river area should be generally inaccessible except by trail. There should be no roads, railroads or other provision for vehicular travel; however, a few existing roads leading to the boundary of the river area are acceptable.

The river meets or exceeds criteria of federally approved State standards for aesthetics, propagation of fish and wildlife normally adapted to the river and primary contact recreation.

Scenic River

The river should be free of impoundments.

The shoreline should be largely primitive and undeveloped with no substantial evidence of human activity; however, the presence of small communities, dispersed dwellings or farm structures is acceptable. Evidence of past or ongoing timber harvest is acceptable if the forest appears natural from the river bank.

The river area may be accessible in places by roads, and roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.

No criteria for water quality is prescribed in the Act. Poor water quality does not preclude classification provided a water quality improvement plan exists or is being developed.

Recreational River

The river may have some existing impoundments or diversions. The existence of low dams, diversions, or other modifications is acceptable if the waterway remains generally natural and riverine in appearance.

The shoreline may have some development with substantial evidence of human activity. The presence of extensive residential developments and a few commercial structures is acceptable. Lands may have been developed for a full range of agricultural or forestry uses and may show evidence of past or ongoing timber harvest.

The river area may be readily accessible by roads or railroads. The existence of parallel roads or railroads on one or both banks and bridge crossings is acceptable.

No criteria for water quality is prescribed in the Act. Poor water quality does not preclude classification provided a water quality improvement plan exists or is being developed.

Suitability Criteria

The determination of suitability is the basis for the decision to recommend designation of a river for inclusion in the national river system. The factors considered are:

The amount of private land involved and the uses on the land;

The estimated cost of acquisition of land or an interest in the land if the river area cannot be administered as a wild and scenic river without acquisition as a means of control;

Public, State, and local government interest; and

Land and water uses enhanced, foreclosed, or curtailed if the river is designated.

Summary of Assessment of Potential
Santee River, from Lake Marion to Atlantic Ocean

Inventory Length	Length in NFS Land	Free Flowing?	Outstandingly Remarkable Values?	Classification	Eligible	Recommended?
95 Miles	18 Miles*	No	Yes**	Wild	No	No
95 Miles	18 Miles*	No	Yes**	Scenic	No	No
95 Miles	18 Miles*	No	Yes**	Recreational	Yes	No

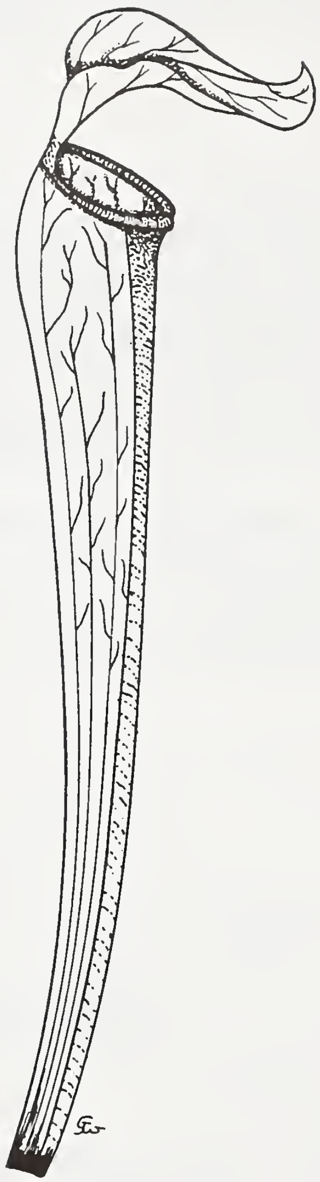
* All NFS ownership is along one bank.

** This portion of the Santee River is in the Santee River Focus Area which is a component of the Atlantic Coast Joint Venture, a cooperative effort which is part of the North American Waterfowl Management Plan. The objective of the Focus Area is to protect, preserve, and enhance wetland wildlife habitat in the Santee River Floodplain. The Focus Area is administered by a task force comprised of private landowners, the Historic Rice fields Association, the US Forest Service, Ducks Unlimited, the US Fish and Wildlife Service, and the SC Wildlife and Marine Resources Department.

The Focus Area contains approximately 575,000 acres (See Focus Area Map.) and is important as an overwintering and breeding site for waterfowl; foraging, nesting and wintering habitat for bald eagle, osprey and numerous wading birds; the northernmost nesting population of swallow-tailed kite; and nesting habitat for several species of neotropical migratory birds.

The Santee River supports a commercial shad fishery, is the key striped bass brood stock collection site in the state, and is the key passage for anadromous fish to the Santee-Cooper lake system. It provides 16% of the freshwater sport fishing in the state.

The outstandingly remarkable values outlined above are likely to be maintained and enhanced through the Focus Area designation, and the river is not recommended to be designated as a recreational river under the Wild and Scenic Rivers Act.



Appendix F
Ecological Communities

I. Terrestrial
- A. Terrestrial Forests
  - 6. Interior Upland Dry and Dry-Mesic Forests
    - a. Dry Shortleaf Pine - Oak - Hickory Forest
    - c. Interior Flatwoods Forest
    - e. Loblolly Pine - Shortleaf Pine - Oak Forest
    - i. Interior Upland Dry-Mesic Oak - Hickory Forest
    - j. Interior Calcareous Oak - Hickory Forest
  - 8. Coastal Plain Mesic Forests
    - b. Coastal Plain Calcareous Mesic Forest
    - d. Southern Mixed Hardwood Forest
- B. Terrestrial Woodlands/Savannas
  - 6. Southern Pine and Pine - Oak Woodlands/Savannas
    - b. Southeastern Coastal Plain Xeric Sandhill
    - c. Southeastern Coastal Plain Subxeric Pine - Scrub Oak Sandhill
    - f. Pine - Oak Granitic Flatrock Border Woodland
    - i. Atlantic Coastal Plain Mesic Longleaf Pine Forest
  - 7. Southern Oak Woodlands/Savannas
    - a. Southeastern Coastal Plain Turkey Oak Barrens
- C. Terrestrial Shrublands
  - 5. Piedmont/Coastal Plain Shrubland
    - a. Piedmont/Coastal Plain Heath Bluff
- E. Mixed Physiognomy Terrestrial Communities
  - 2. Acidic Cliffs
    - d. Coastal Plain Acidic Cliff
  - 5. Calcareous Rocky Slopes/Outcrops
    - c. Atlantic/Gulf Coastal Plain Marl/Shell Bluff
- F. Terrestrial Anthropogenic Ecological Communities
  - 1. Developed (built up) Upland (Urban, Institutional, Industrial, Communication, etc.)
    - a. Actively Maintained Developed Land
    - b. Abandoned Developed Land
  - 2. Agricultural Land
    - a. Cropland, Herbaceous
    - b. Vineyard/Shrub Cropland
    - c. Pasture/Hay meadow (dominated by non-native species)
    - d. Fruit/Nut Orchard
    - e. Wildlife Food Plot
    - f. Abandoned Agricultural Land
    - g. Other Agricultural Land, Actively Managed or Abandoned
  - 3. Forestry/Timber Production Land without Structures, Actively Managed
    - a. Recently Harvested Timber Land (Clearcut/ Salvage Cut, Seedtree Cut, Other)
    - b. Plantation (Hardwood or Conifer)
    - c. Other Forestry/Timber Production Land (Seed Tree Orchard, Log-loading Area, etc.)

II. Palustrine
- A. Forested Palustrine Wetlands
  - 2. Interstream and Streamhead Forested Wetlands on Organic Soils
    - a. Bay Forest
    - b. Atlantic White Cedar Swamp Forest
  - 3. Forested Wetlands in Depressions on Organic Soils
    - b. Nonriverine Swamp Forest
  - 4. Forested Riverine Swamps (Zone II)
    - a. Bald Cypress Swamp
    - b. Bald Cypress - Water Tupelo Swamp
    - c. Bald Cypress - Swamp Black Gum Swamp
    - d. Tupelo Swamp
    - f. Bald Cypress - Hardwood Swamp Forest
  - 5. Wet River Floodplain Forests (Zone III)
    - a. Overcup Oak - Water Hickory Bottomland Forest
    - b. Coastal Plain Small Stream Swamp Forest
  - 6. Wet-Mesic River Floodplain Forests (Zone IV)
    - a. Willow Oak Forest
    - b. Sweetgum - Mixed Bottomland Oak Forest
    - d. Sugarberry - American Elm - Green Ash Bottomland Forest
  - 7. Wet Riverfront and Stream Bar Forests (Zones III-V)
    - a. Black Willow Riverfront Forest
    - b. River birch - Sycamore Riverfront Forest
    - c. Eastern Cottonwood - Willow Riverfront Forest
    - g. Sycamore - Sweetgum - American Elm Riverfront Forest
  - 8. Mesic River Floodplain Forests (Zone V)
    - a. Forested Canebrake
    - b. Swamp Chestnut Oak - Cherrybark Oak Bottomland Forest
    - c. Lowland Pine - Oak Forest
    - d. Calcareous Bottomland Forest
  - 9. Forested Seepage Slopes
    - c. Forested Coastal Plain Seep
  - 10. Forested Wetlands on Mineral Soils in Depressions or on Nonriverine Flats
    - a. Pond Cypress Pond Forest
    - b. Swamp Tupelo Pond Forest
    - c. Wet Marl Forest
    - e. Nonriverine Wet Hardwood Forest

- B. Woodland/Savanna Wetlands
  - 1. Woodland/Savanna Wetlands on Flat Coastal Terraces
    - b. Wet Longleaf Pine Flatwoods
    - d. Atlantic Coastal Plain Wet Longleaf Pine Savanna
    - g. Atlantic Coastal Plain Wet-Mesic Longleaf Pine Savanna
  - 2. Woodland/Savanna Wetlands in Basins
    - a. Pond Cypress Savanna
    - b. Pond Pine Woodland
    - c. Peatland Canebrake
  - 3. Woodland/Savanna Wetlands on Slopes
    - a. Longleaf Pine Seep
    - b. Streamhead Pocosin
    - c. Streamside Pocosin

C. Shrub Wetlands
1. Shrub Wetlands in Basins
a. Low Pocosin
b. High Pocosin
c. Small Depression Pocosin
3. Shrub Wetlands on Slopes
a. Coastal Plain Seepage Shrub Slope
4. Shrub Wetlands on River Edges
b. Coastal Plain River Edge Shrub Wetland
D. Herbaceous Wetlands
1. Freshwater Herbaceous Wetlands on Alluvial and Non-Alluvial Flatlands
b. Coastal Plain Pitcher Plant Flat
d. Interior Freshwater Marsh
2. Freshwater Herbaceous Wetlands in Basins
d. Atlantic Coastal Plain Depression Meadow
3. Freshwater Herbaceous Wetlands on Slopes
b. Coastal Plain Hillside Herbaceous Seepage Bog
6. Freshwater Ponds with Floating Aquatic Vegetation
a. Natural Impoundment Pond
8. Freshwater Open Water Ponds
a. Floodplain Pool
E. Palustrine Physiognomic Complexes
1. Wetland Physiognomic Complexes in Depressions
f. Coastal Plain Small Depression Pond Complex
h. Coastal Plain Lakeshore Complex
3. Riverside Wetland Complexes
a. Riverside Shoal and Stream Bar Complex
F. Palustrine Anthropogenic Ecological Communities
1. Developed Freshwater Wetlands
a. Actively Maintained
b. Abandoned Developed or Modified Freshwater Wetland
2. Agricultural Wetlands
a. Wetland Cropland/Herbaceous
b. Wetland Pasture/Haymeadow
c. Pond
d. Other Agricultural Wetland (Fish Hatchery, etc.)
3. Forestry/Timber Production Wetland without Structures, Actively Managed
a. Recently Harvested Forested Wetland (Clearcut/ Salvage Cut, Seedtree Cut, Other)
b. Wetland Plantation (Hardwood or Conifer)
c. Other Forestry/Timber Production Wetland
4. Artificially Created or Actively Managed Undeveloped Wetland
a. Artificially Flooded Backswamp
b. Actively Managed Tidal Freshwater Impoundment Marsh
c. Actively Managed Nontidal Freshwater Impoundment Marsh
d. Other (Mitigation Wetland, Cooling Reservoir, etc.)
5. Wetlands Dominated by Exotic Species (otherwise undisturbed)
a. Exotic Herb-dominated Wetland
b. Exotic Shrub-dominated Wetland
c. Exotic Tree-dominated Wetland

F. Estuarine Anthropogenic Ecological Communities

1. Developed (built up) Estuarine Wetlands (Urban/sub-urban, Industrial, Commercial, Recreational, etc.)
   a. Actively Maintained
   b. Abandoned Developed or Modified Estuarine

   Wetlands
2. Artificially Created or Actively Managed Undeveloped Estuarine Wetlands
   a. Artificial Estuarine Impounded Bay
   b. Artificial Estuarine Channel/Ditch
   c. Actively Managed Artificial Estuarine Impoundment Marsh
   d. Other Artificial Estuarine Impoundment

This is a subset of communities from Allard, D. J. 1990.
Southeastern United States ecological community classification.
Updated interim report, Version 1.2, with changes through June 27, 1992. The Nature Conservancy, Southeast Regional Office, Chapel Hill, NC.

Appendix G
Chief's Policy Letter on Ecosystem Management

United States Department of Agriculture	Forest Service	Washington Office	14th & Independence SW P.O. Box 96090 Washington, DC 20090-6090

Reply to: 1330-1 Date: June 4, 1992

Subject: Ecosystem Management of the National Forests and Grasslands

To: Regional Foresters and Station Directors

We have made good progress over the past 3 years in experimenting with more environmentally sensitive ways to manage the National Forests and Grasslands under our New Perspective program. We learned a lot from our field demonstration projects, research effort, university symposia, and workshops. Mostly what we learned is that ecosystem management works and it is where we need to be headed with our research program and the management of the National Forests and Grasslands. The Chief and Staff decided last month that it was time to take what we have learned over the past 3 years and implement a new management philosophy for the National Forests and Grasslands. Putting this in simple terms, we have been courting the ecosystem approach for 3 years and we like the relationship and results. Today, I am announcing the marriage and that the Forest Service is committed to using an ecological approach in the future management of the National Forests and Grasslands.

By ecosystem management, we mean that an ecological approach will be used to achieve the multiple-use management of the National Forests and Grasslands. It means that we must blend the needs of people and environmental values in such a way that the National Forests and Grasslands represent diverse, healthy, productive, and sustainable ecosystems. I'm confident that with our knowledge, expertise, and experience along with a stronger public involvement effort, we can bring the American people and their needs together with the land they own in a better way than it has ever been done before by anyone in the world. That's our challenge under this new policy of ecosystem management.

An ecological approach to managing the National Forests and Grasslands is the right way to go because forests are dynamic and complex ecosystems. Forest ecosystems change over time whether managed by people or not. Our management and care is essential to providing diverse and productive habitat for wildlife and fisheries, clean water, clean air, outstanding opportunities for outdoor recreation, natural wood products for American families, and long-term stability to the ecosystem. In a global framework, the forests play a vital role in being the lungs of the earth absorbing carbon dioxide and giving off oxygen.

The forests also serve as an important air filter by taking pollutants out of the air and storing them in the forests. These are important reasons why we must put the management of National Forests and Grasslands on an ecological basis. I know this is a tall order, but I believe we are now in good position to do it, and I have confidence in the capability of Forest Service people.
As we learned under New Perspectives, there are three very important points that must be carried forward to make ecosystem management successful:

1. Public involvement - Like never before, the Forest Service must renew its commitment to public involvement and actively seek out and incorporate people's views in our decisions about the management of the National Forests and Grasslands. I envision a new, higher level of dialogue or partnership with the American people to go along with ecosystem management. This is even more important now in view of the proposed changes in the administrative appeal process.

2. Conservation partnerships - Coupled with public involvement, we must expand our partnerships with State and local governments, the private sector, conservation organizations, and anyone else who has a shared interest in the National Forests and Grasslands. Let's get them more involved in helping get the conservation job done. The job is simply too big for the Forest Service working alone. Let's challenge people to lend a helping hand by working together in partnership.

3. Land manager/scientist partnership - We have made great progress under New Perspectives to get land managers and scientists working together as a team in doing the best job possible. Let's keep it up and make sure our decisions reflect the best science and close the gap between the level of scientific knowledge and its application in our day-to-day management.

To further round out the new policy on ecosystem management as defined above, the following basic principles will apply to the future management of the National Forests and Grasslands:

1. "Take Care of the Land" by protecting or restoring the integrity of its soils, air, waters, biological diversity, and ecological processes.

2. "Take Care of the People and their Cultural Diversity" by meeting the basic needs of people and communities who depend on the land for food, fuel, shelter, livelihood, recreation, and spiritual renewal.

3. "Use Resources Wisely and Efficiently to Improve Economic Prosperity" of communities, regions, and nations by cost-effective production of natural resources such as wood fiber, water, minerals, energy, forage for domestic animals, and recreation opportunities.

4. "Strive for Balance, Equity, and Harmony Between People and Land" across interests, across regions, and across generations by sustaining what Aldo Leopold (1949) called the land community, meeting this generation's resource needs, and maintaining options for future generations to also meet their needs.

To further add meaning to the policy and principles, I am attaching a set of working guidelines for ecosystem management (attachment 1).

A special issue that we must deal with under ecosystem management is clearcutting. We must accelerate the reduction in clearcutting as a standard commercial timber harvest practice on the National Forests. In making future forest management decisions, clearcutting is to be used only where it is essential to meet specific forest plan objectives and within the circumstances outlined in the attached policy paper (attachment 2).

In summary, the above policy, principles, and guidelines provide firm direction to manage the National Forests and Grasslands on an ecological basis in the future. Yet, there is much room and flexibility for the professionals on the ground in working with the public to work out the many details to practice ecosystem management on each National Forest.

I am asking each Regional Forester and Station Director to work together in evaluating their regional situation and within 90 days develop a strategy for implementing the above policy, principles, and guidelines. We need to make good progress at a reasonably rapid pace without disrupting programs, recycling project decisions, or redoing project field work. Also, you will need to take advantage of the flexibility within existing forest plans to practice ecosystem management. As forest plans need to be amended or revised they should reflect the above policy on ecosystem management.

We have just celebrated the 100th Anniversary of the National Forest System. In our history, we have built upon Gifford Pinchot's 1905 philosophy of "conservation and wise use" and "the greatest good for the greatest number in the long run" with the 1960 multiple-use philosophy for sustained yield of natural resources.

We begin our next century with an additional perspective. Ecological management with a higher sensitivity to all of the environmental values of the National Forests is the next logical step in our mission of caring for the land and serving people. Each of you can feel that you truly have been a part of history, and I hope you share my excitement and enthusiasm for the future as we head down the road toward ecosystem management as the best way to meet our multiple-use mandate.

/s/ F. Dale Robertson
F. DALE ROBERTSON
Chief

Attachment 1

Working Guidelines for Ecosystem Management

1. Focus on desired present and future conditions of the land and its human communities. Focus management actions to achieve desired current and future conditions of the land at multiple scales (Caplan 1992), always seeking to balance goals for the land:

—the beauty of the land,
—the stability and fertility of its soils,
—the quality and flows of its waters,
—the clarity of the air,
—the diversity of plants, animals, and biological communities, and
—the interconnectedness and character of habitats and landscapes that provide for the health and resilience of ecological systems and processes;

with goals for the people:
—the prosperity,
—the diversity, and
—the health and vitality of the people who depend on the land for their livelihoods, outdoor recreation opportunities, and inspirational experiences.

Desired conditions must take into consideration economic feasibility and the health, productivity, and resilience of the land over time in the face of unplanned and uncertain future events such as fires, storms, and insect epidemics (Waring and Schlesinger 1985, Botkin 1990). They must also consider continental and global economic and environmental effects of choices made at local and regional scales, e.g., the energy costs of alternative materials.

2. Integrate thinking and actions at multiple spatial and temporal scales. Think about the effects of proposed actions at several geographic scales and through time (Forman and Godron 1986); at least one scale larger and one scale smaller than the scale you are working at and at least for several decades in the future; more and longer if possible.

3. Be especially careful in sensitive areas. Protect special places such as wetlands, endangered species, rare plant populations, and cultural resources.

4. Employ the ecological capabilities and processes of the land. Work within the ecological potential of sites and landscapes, maintain native diversity, and employ nature's processes to the greatest degree possible.

5. Get people involved in planning and carrying out project work. Involve interested and affected people in the full process of making decisions about common resources; plan as if you are in a fishbowl to make sure everyone who wants to has access and knows what is going on; make conservation partnerships the rule rather than the exception.

6. Involve scientists through adaptive management. Monitor research, interpret, and adapt—integrate research with operational management and set resource management up as the continual experiment and learning opportunity that it always has been and always will be.

7. Integrate resource management for operational efficiency. Integrate resources, integrate actions across geographic scales, and build a community of interests—integrate everything and all the time but not necessarily everything on every acre at all times—this is biologically impossible and, therefore, technically infeasible. Use good judgment!

Attachment 2

Reduce Clearcutting on the National Forests

The objective of this new provision is to reduce clearcutting on National Forest System lands and make greater use of individual tree selection, group selection, green tree retention, shelterwood, seed tree, and other regeneration cutting methods which collectively provide for a more visually pleasing and diverse vegetative appearance on a forest-wide basis.

This policy would reduce clearcutting where it has been used as a standard timber harvest practice on the National Forests. Clearcutting would be limited to areas where it is essential to meet forest plan objectives and involve one or more of the following circumstances:

1. To establish, enhance, or maintain habitat for threatened, endangered, or sensitive species.

2. To enhance wildlife habitat or water yield values, or to provide for recreation, scenic vistas, utility lines, road corridors, facility sites, reservoirs, or similar development.

3. To rehabilitate lands adversely impacted by events such as fires, windstorms, or insect or disease infestations.

4. To preclude or minimize the occurrence of potentially adverse impacts or insect or disease infestations, windthrow, logging damage, or other factors affecting forest health.

5. To provide for the establishment and growth of desired trees or other vegetative species that are shade intolerant.

6. To rehabilitate poorly stocked stands due to past management practices or natural events.

7. To meet research needs.

This clearcutting policy combined with the new USDA-Forest Service ecosystem management can reduce clearcutting by as much as 70 percent from FY 1988 levels. The reduction on timber volume over the short-run is likely to be about 10 percent. There would be little reduction in timber volume over the long-term. There will be increases in timber sale costs and some areas will not be harvested because local timber industries do not have appropriate logging equipment to use other methods on steep slopes. However, judicious use of alternative harvest methods can be substituted for clearcutting on most areas of the National Forests.

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